BOTANICAL MUSEUM LEAFLETS

HARVARD UNIVERSITY

PRINTED AND PUBLISHED AT THE
BOTANICAL MUSEUM
CAMBRIDGE, MASSACHUSETTS

BOTANICAL MUSEUM LEAFLETS

HARVARD UNIVERSITY

VOLUME X

BOTANICAL MUSEUM
CAMBRIDGE, MASSACHUSETTS
1941-1942

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ERRATA

page 5, line 28
for 48 read 58

page 36, lines 7 and 8
for *C. Schweinfurth* read C. Schweinfurth

page 43, line 31
for in equal pairs read in unequal pairs

page 45, line 14
for *caulida* read *candida*

page 55, line 7
for *Corymborchis* read *Corymbis*

page 57, line 2
for fig. 4 read fig. 3

page 57, line 18
for 614 read 618

page 64, line 4
delete cum

page 82
delete lines 20 and 21

page 149, line 27
for *aromatica* read *aromaticus*

page 155, lines 25 and 31
for Summerhays read Summerhayes

page 155, line 31
for (1917) read (1927)

page 156, line 14
for *aromatica* read *aromaticus*

page 165, line 15
for Waldt. read Waldst.

page 166, line 20
for Archangeli read Arcangeli

page 246, line 7
for resevoir read reservoir

page 274, line 11
for papillato-puberuli read papillato-puberulae

page 280, line 4
for *Mechrowii* read *Mechowii*

page 283, line 12
for this read his

page 301, line 26 (footnote)
for Caldasia 1 read Caldasia No. 4

Sci

BOTANICAL MUSEUM LEAFLETS

HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, JUNE 25, 1941 VOL. 10, NO. 1

STUDIES IN ISOCHILUS, MORMODES AND HEXALECTRIS

BY

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I. THE GENUS ISOCHILUS

IN 1813, Robert Brown proposed the genus *Isochilus* based on *Epidendrum lineare* Jacquin. Since 1813, twenty-nine additional species have been assigned to the genus. Sixteen of these species have been transferred to other genera. The remaining fourteen appear to be reducible to two species, each of which includes two varieties.

All of the entities retained in *Isochilus* are very closely related to one another. However, allowing for intermediate plants, the genus may be divided into two rather distinct categories—(1) plants possessing a typically compact unilateral inflorescence (*I. major*) and (2) plants possessing a typically loose distichous or occasionally laxly unilateral inflorescence (*I. linearis*).

A less critical treatment of the genus would perhaps result in placing both *I. major* and *I. linearis* in one polymorphic species. However, if typical *I. linearis* is compared with typical *I. major*, this procedure would seem to be extremely radical. Hence, always bearing in mind the extreme variability of the genus as a whole, it seems best to recognize in the genus several groups exhibiting more or less similar and constant characters.

As is the case with many other species included in the subtribe Ponereae, the segregates in *Isochilus* are on the whole more readily distinguished from one another on vegetative rather than on floral characters. The flowers of the various segregates have no constant characters whereby they may be easily distinguished. They may consist of a graduated series from large to small, and the freedom or adnation of the sepals may vary considerably even among flowers in the same raceme.

According to J. A. Steyermark, plants of *Isochilus* are used in Guatemala in the treatment of colic, dysentery and other intestinal disorders. The species are commonly known as "Calaqual", "Sanguinaria", "Nido de Pajaro" and "Cresta de Gallo".

The key has been arranged so as to show the relationships of the various segregates. Extremes which represent the typical entities retained are easily eliminated through the use of the key. However, it must be admitted that intergrades are found between those forms connected by arrows in the key.

In order to make this paper more complete, all of the species erroneously assigned to the genus *Isochilus* have been included at the end of the paper where their present status is indicated.

Isochilus *R. Brown* in Aiton Hort. Kew. ed. 2, 5 (1813) 209.

Leptothrium Kunth in Humboldt, Bonpland and Kunth Nov. Gen. & Sp. 1 (1816) 340, non Kunth Rév. Gram. (1830) 156.

Isochilos Sprengel Syst. Veg. 3 (1826) 734, in part.

Caespitose or repent epiphytic, terrestrial or rock-inhabiting plants with slender stems and numerous distichous leaves, the rhizomes concealed by dark brown warty sheaths. Leaves strictly erect to spreading, linear,

lanceolate or oblong, more or less retuse at the apex, rigidly membranaceous to subcoriaceous. Inflorescence a terminal densely or loosely flowered unilateral or distichous raceme of one to many flowers. Floral bracts short or elongated, suborbicular to oblong, paleaceous. Flowers small, variously colored from nearly white to deep rose-purple, with short pedicellate ovaries, often partly concealed by the subtending bracts or upper leaves. Sepals subequal, erect or recurved, concave, varying from free to coherent almost to the apex, gibbous at the base under the lip, more or less dorsally carinate along the mid-nerve or occasionally broadly winged on the back (especially the lateral ones), free part elliptic to lanceolate and obtuse to subacuminate. Petals with a slender claw, a little shorter and broader than the sepals, ecarinate, oblique, oblong-lanceolate, elliptic or obovate. Lip with a short claw, subequal to the petals but narrower, adnate to the base of the column or the short column-foot, linear to linear-oblanceolate, obtuse to acute, commonly sigmoid-flexuose below or slightly above the middle or both, sometimes constricted near the middle, variously marked on the claw and at about the middle of the lamina. Column erect, semiterete, wingless, toothed at the apex, apparently footless or produced at the base into a short inconspicuous foot; anther terminal, operculate, incumbent, 2-celled; pollinia four, waxy, ovoid-oblong, elongated and laterally compressed. Capsule small, ellipsoid or ovoid.

KEY TO ISOCHILUS

A. Flowers in a loose distichous or occasionally unilateral raceme, one or only a few; leaf-sheaths more or less verrucose

Leaves narrowly linear, strict or somewhat erect-spreading; flowers small, mostly less than 8 mm. long, one to several, commonly distichous . . . . . 1. *Isochilus linearis*

Leaves oblong to linear-lanceolate, short, erect-spreading; flowers about 8 mm. long, commonly distichous . . . . . 2. *I. linearis* var. *carnosiflorus*

Leaves linear, strict; flowers large, 1 cm. or more long, commonly unilateral . . . . . 3. *I. linearis* var. *unilateralis*

AA. Flowers in a dense compact unilateral raceme, usually numerous; leaf-sheaths characteristically smooth and green-spotted or vernicose

Leaves oblong-ligulate to oblong-lanceolate, erect-spreading; leaf-sheaths densely brownish verrucose . . . . 5. *I. major* var. *alatus*

Leaves linear, strict, often closely appressed to the stem; leaf-sheaths commonly smooth . . . 6. *I. major* var. *Amparoanus*

Leaves linear-lanceolate, somewhat spreading or occasionally strict; leaf-sheaths commonly smooth . . . . . 4. *Isochilus major*

1. **Isochilus linearis** *(Jacq.) R. Brown* in Aiton Hort. Kew. ed. 2, 5 (1813) 209—Cogniaux in Martius Fl. Bras. 3, pt. 5 (1898) 3, t. 1—Schweinfurth in Bot. Mus. Leafl. Harvard Univ. 8 (1940) 44.

Helleborine tenuifolia repens Plumier Cat. Pl. Amer. (1703) 9.

Serapias foliis linearibus; radice repente, floribus spicatis Plumier Pl. Amer. (ed. Burm.) (1758) 177, t. 182, fig. 1.

Epidendrum lineare Jacquin Select. Stirp. Amer. (1763) 221, t. 131, fig. 1.

Cymbidium lineare Swartz in Nov. Act. Upsal. 6 (1799) 72—Willdenow Sp. Pl. 4 (1805) 97.

Leptothrium lineare Kunth ex Steudel Nomencl., ed. 2 (1840) 32.

Isochilus leucanthus Rodriguez Gen. & Sp. Orch. Nov. 1 (1877) 47.

Isochilus linearis R. Brown var. *β. leucanthus* Cogniaux in Martius Fl. Bras. 3, pt. 5 (1898) 4.

Isochilus pauciflorus Cogniaux in Urban Symb. Antill. 6 (1910) 459.

Isochilus Langlassei Schlechter in Fedde Repert. 16 (1920) 442.

Isochilus peruvianus Schlechter in Fedde Repert. Beih. 9 (1921) 79; ex Mansfeld in Fedde Repert. Beih. 57 (1929) t. 116, Nr. 455.

Isochilus brasiliensis Schlechter in Fedde Repert. Beih. 9 (1921) 80; in Fedde Repert. Beih. 48 (1930) t. 39, fig. 155.

Isochilus linearis is related to var. *unilateralis* primarily through the linear leaves and verrucose leaf-sheaths. It is related to var. *carnosiflorus* through the verrucose leaf-sheaths and through the type of flowers which are commonly arranged in a loose distichous raceme. The flowers are variously colored. Collectors' notes give

the color as "white", "orange-yellow", "brick-red", "orange", "rose-purple with 2 dark stains on the lip", "vermillion-orange", "red-violet", "purple", "flame scarlet", "bright red", "cerise pink", "violet" and "lilac".

This is the most common and widespread *Isochilus*. It is found from near sea level up to 3900 meters altitude in cloud forests in Mexico, throughout Central America and the West Indies, and in the northern half of South America. It occurs as a terrestrial, on rocks and logs, or on various species of trees, mainly in pine-oak forests.

Cogniaux proposed *I. pauciflorus* based primarily on a one- to few-flowered plant in contrast to his so-called numerous-flowered *I. linearis*. An examination of Jacquin's figure of *Epidendrum lineare*, upon which *Isochilus linearis* is based, shows a three-flowered plant. This type of few-flowered plant illustrated by Jacquin is the common form found in the West Indies. It is apparent that Cogniaux described as a new species the typical form of *I. linearis* and considered as *I. linearis* a more uncommon form of the species. The secondary characters given for each of Cogniaux' segregates have been found to intergrade too freely to be of specific value.

A study of the original description and an examination of Schlechter's illustration of a flower of *I. peruvianus* shows that it is referable to *I. linearis*. The vegetative description and floral analysis compare favorably with typical *I. linearis*.

An examination of a floral analysis of *I. brasiliensis* shows that the flowers of this concept are not unlike those of some of the forms of *I. linearis*. Apparently no formal description was ever written by Schlechter for *I. brasiliensis*.

SPECIMENS EXAMINED:

MEXICO—"Sierra Madre", *Langlassé 1023* (Type collection of *I. Langlassei*, isotype seen); Tamaulipas: *Palmer 353*; Michoacán: *Vera 7054*; Mexico: *Hinton 899*; Morelos: *Williams 3828, Juan G. 2605, 2607*; Guerrero: *Nagel & Juan G. 3316, 1676, Nagel 3118, Hinton 14281*; Chiapas: *Ghiesbrecht 8, Nagel 5684.*

GUATEMALA—Amatitlan: *Shannon 3671*; Chimaltenango: *Standley 60075, 60924, Skutch 505*; Guatemala: *Porter 1, Johnston 1313, 1379, Standley 58440*; Huehuetenango: *Skutch 1041*; Jalapa: *Steyermark 32772, 32829*; Quetzaltenango: *Skutch 797 (in part)*; San Marcos: *Steyermark 35809, 36048.*

SALVADOR—Ahuachapán: *Standley 20205.*

HONDURAS—Colon: *Ames II 187*; Comayagua: *Edwards 476 (in part), Yuncker, Dawson & Youse 6369*; Tegucigalpa: *Edwards 34, 121*; also "Cortez", *Yuncker 4854.*

COSTA RICA—Cartago: *Standley 39951*; Guanacaste: *Dodge & Thomas 6282, Standley & Valerio 44202, 46105*; San José: *Standley 32224, 34092*; also "San Juan", *Jiménez 819.*

CUBA—Oriente: *Wright 633, Shafer 3116, 3587, 8682, 8942*; Santa Clara: *Britton 5004, Jack 6515, 6865, 7058, Smith, Hodgdon & Gonzalez 3322.*

JAMAICA—*Orcutt 3027, Britton 3870, Nichols 131, Wolle.*

HAITI—*Leonard 9097, Ekman 469.*

SANTO DOMINGO—*Fuertes 652, 1905b, Tuerckheim 3386, Taylor 108.*

PUERTO RICO—*Sintenis 4378, 4437, 6236, Horne 5867, Britton & Horne 7491.*

GUADELOUPE—(Gray Herb.).

DOMINICA—*Toepffer 646, Lloyd 791.*

MARTINIQUE—*Duss 2079, Hahn 85, Sieber.*

ST. VINCENT—*Smith 471.*

VENEZUELA—Barquisimeto: *Saer 105*; "Tovar", *Fendler 1439.*

BRAZIL—Bahia: (Herb. Ames); Minas Geraes: *Mexia 4255a*; Paraná: *Dusén 17081*; also "Santo Angelo", *Lindman 1125* and "Brazil", *Sello.*

BOLIVIA—La Paz: *Buchtien 5018*; *Bang 2913.*

PARAGUAY—"Estancia Primera", *Rojas 5309.*

ARGENTINA—Jujuy: *Fries 206, Venturi 5390.*

2. **Isochilus linearis** *(Jacq.) R. Brown* var. **carnosiflorus** *(Lindl.) Correll comb. nov.*

Isochilus carnosiflorus Lindley in Paxton Mag. Bot. 11 (1844) 213; 12 (1845) 263.

Isochilus crassiflorus A. Richard & Galeotti in Ann. Sci. Nat., ser. 3, 3 (1845) 22.

Isochilus linearis var. *carnosiflorus* is related to *I. major* var. *alatus* in the shape and arrangement of the leaves and in the verrucose leaf-sheaths. Except for the difference in the type of inflorescence, some of the forms of var. *carnosiflorus* approach var. *alatus* very closely. It is allied to *I. linearis* var. *unilateralis* in the rather large flowers and in the type of inflorescence in some of the plants. The differences in the leaves, however, immediately distinguish these two varieties.

According to collectors' notes, the flowers are "magenta and wax-like", "dark rose and wax-like", "purplish pink with 2 dark stains on lip", "red-purple", "rose-purple", "purple", "pink", "bright magenta" and "mallow-purple". It would seem that the flowers are quite fleshy in this variety since they are characterized by some collectors as "wax-like".

This variety is found from near sea level up to 2800 meters altitude in Mexico, British Honduras, Guatemala, Honduras and Costa Rica. It occurs usually in dense shade and is commonly found on mangroves at sea level, on coco plum, in mixed oak-pine forests or on rocks.

An examination of a drawing of the habit and floral analysis of *I. crassiflorus* by Richard shows the characteristic leaves and inflorescence of var. *carnosiflorus*. The floral analysis also agrees favorably with that of var. *carnosiflorus*.

SPECIMENS EXAMINED:

MEXICO—Vera Cruz: *Conzatti & Gonzalez C/640*; Guerrero: (collector?). *No. 1889* (Herb. Ames); Oaxaca: *Nagel 5300, Nagel & Juan G. 6454.*

BRITISH HONDURAS—*Schipp 776, Bartlett 11287.*

GUATEMALA—Alta Verapaz: *Johnson 295, 1067*; Izabal: *Steyermark 38614*; San Marcos: *Steyermark 36697a*; Suchitepéquez: *Steyermark 35250.*

HONDURAS—Atlantida: *Standley 54184, 55439, Davis.*

COSTA RICA—Alajuela: *Valerio 2538, Jiménez L. & Lankester 2075*;

Cartago: *Lankester 1066*; Guanacaste: *Standley & Valerio 44320, 44426, 44465, 44608, 44724, 44849, 45140, 45314, 45653, 45977, 46437*; Limón: *Standley 37540*; San José: *Alfaro 120 (in part).*

3. **Isochilus linearis** (*Jacq.*) *R. Brown* var. **unilateralis** (*Robins.*) *Correll comb. nov.*

Isochilus unilaterale Robinson in Proc. Amer. Acad. 29 (1894) 323.

Isochilus linearis var. *unilateralis* has the largest flowers of any *Isochilus*. In this respect it approaches *I. major*. However, the few-flowered loose inflorescence, narrow leaves and verrucose leaf-sheaths place it closer to *I. linearis*. The flowers are as much as 1.5 cm. long and, in some of the specimens, are exserted above the leaves by the peduncle-like upper part of the stem. They are described by collectors as "pink", "phlox-pink", "phlox-purple" and "rose-purple". The linear leaves are strictly erect or only slightly spreading.

This variety is apparently restricted to a small region in east central Mexico where it is found on trees in humid forests from 500 to 1400 meters altitude.

SPECIMENS EXAMINED:

MEXICO—San Luis Potosi: *Pringle 5116* (Type of *I. unilaterale*), *Nagel 5106*, *Nagel & Juan G. 4796*, *Dino 6954*; Tamaulipas: *Viereck 953*, *Roszinsky 663*; Puebla: *Östlund 5862.*

4. **Isochilus major** *Chamisso & Schlechtendal* in Linnaea 6 (1831) 60.

? *Isochilus latibracteatus* A. Richard & Galeotti in Ann. Sci. Nat., ser. 3, 3 (1845) 22.

Isochilus chiriquensis Schlechter in Fedde Repert. Beih. 17 (1922) 25.

This species typifies the second line of development found in *Isochilus*. The comparatively large unilateral raceme and lanceolate leaves distinguish it at once from *I. linearis* and its varieties. The upper leaves which commonly half conceal the inflorescence are nearly always

tinged the color of the flowers. The flowers, according to collectors' notes, are "rose-colored", "lavander", "white stained magenta-purple on the lip", "white with pink hue", "pink" and "pink, at lip-base 2 darker stains".

Isochilus major is found on the mainland from southern Mexico to Panama. It is represented from Jamaica by two collections, one of which is doubtful material. It occurs as a terrestrial or epiphyte from about 600 to 2000 meters altitude in open or cloud forests, and is often found growing in large clumps on rocks.

An examination of a photograph of the type of *I. latibracteatus* shows that it is probably referable to the typical form of this species. However, the leaves are rather narrow for *I. major*; it may be that, if it were possible to examine the type, it would be found to be referable to var. *Amparoanus*.

An examination of an isotype of *I. chiriquensis* in the Ames Herbarium (Sheet No. 23831) and a comparison of it with a photograph of the type of *I. major* show that these concepts are essentially the same. Vegetatively they are an exact match. However, *I. chiriquensis* has fewer flowers in a shorter and less compact inflorescence than that of typical *I. major*.

SPECIMENS EXAMINED:

MEXICO—Colima: *Reko 4829*; Michoacán: *Aiken 1378*; Puebla: *Hultén 4931*; Vera Cruz: *Linden 69* (Type of *I. major*, photograph seen), *Galeotti 5170* (Type of *I. latibracteatus*, photograph seen), *Bourgeau 66*, *Pringle 15588*, *Maury 361*, *Foster 1, 15, 18*; Chiapas: *Nagel 4376, 5653*.

GUATEMALA—Jutiapa: *Steyermark 31893*.

HONDURAS—Comayagua: *Edwards 285, 476 (in part)*; Tegucigalpa: *Edwards 15, 16*.

COSTA RICA—Cartago: *Stork 391*.

PANAMA—Chiriquí: *Powell 98* (Type of *I. chiriquensis*, isotype seen), *3380*, *Killip 35532*, *Woodson, Allen & Seibert 1003*.

JAMAICA—*Maxon 10262*, *Maxon & Killip 413*.

5. **Isochilus major** *Cham. & Schlecht.* var. **alatus** (*Schltr.*) *Correll comb. nov.*

Isochilus alatus Schlechter in Fedde Repert. 10 (1912) 360.

Isochilus major var. *alatus* and *I. major* are similar in their leaf size and type of inflorescence, both of which are larger than those of var. *Amparoanus*. They differ somewhat in the shape of the leaves and in the leaf-sheaths. The leaves of var. *alatus* are oblong and the leaf-sheaths are densely brownish verrucose, whereas the leaves of *I. major* are lanceolate and the leaf-sheaths are smooth.

This variety is apparently extremely rare, since it is represented only by the type collection of *I. alatus* from Guatemala.

SPECIMENS EXAMINED:

GUATEMALA—Alta Verapaz: Epiphyte in woods, Cobán, July 1907, *Tuerckheim II 1831* (Type of *I. alatus*, isotype examined).

6. **Isochilus major** *Cham. & Schlecht.* var. **Amparoanus** (*Schltr.*) *Correll comb. nov.*

Isochilus Amparoanus Schlechter in Fedde Repert. Beih. 19 (1923) 27.

Isochilus major var. *Amparoanus* has only the characteristic inflorescence of this group in common with var. *alatus*. It agrees with *I. major* in the typically smooth leaf-sheaths and in the type of inflorescence. It is related to *I. linearis* var. *unilateralis* in the strict linear leaves and in the comparatively rather large flowers of some of its forms. The flowers are said by collectors to be "lavander", "purple", "rose-purple", "pinkish purple", "phlox-purple", "rose-color" and "orange-red".

This variety is found in Mexico and through Central America to Costa Rica. It occurs at from 670 to 2300 meters altitude where it is found as a terrestrial, on rocks,

in lava fields, on trees in dry oak forests or in moist tropical forests.

SPECIMENS EXAMINED:

MEXICO—Michoacán: *Hinton 13678*, *Nagel 2235*; Vera Cruz: *Foster 27*, *Conzatti 353*, *Östlund 2606*, *Purpus 2137*, *3892*, *16300*; Oaxaca: *Nagel 5371*; Chiapas: *Schmeling 6273*, *Nagel 5696*, *Matuda 1813*, *2581*.

GUATEMALA—Alta Verapaz: *Standley 70923*, *Smith 1665*; Chimaltenango: *Johnston 1381*; Chiquimula: *Steyermark 31505*; Guatemala: *Aguilar 172*; Huehuetenango: *Seler 2724*; Jalapa: *Kellerman 7868*; Quetzaltenango: *Skutch 797 (in part)*; Retalhuleu: *Rojas 444*; San Marcos: *Steyermark 37630*; Santa Rosa: *Maxon & Hay 3374*, *Heyde & Lux 3864*, *6243*; Zacapa: *Steyermark 29607*; also "Chocola", *Morton 263*.

SALVADOR—San Salvador: *Calderon 62*; San Vicente: *Standley 21547*.

HONDURAS—Comayagua: *Edwards 66*, *166*, *229*.

COSTA RICA—Cartago: *Standley 36015*, *Danielson* (*Stork 1190*); Guanacaste: *Standley & Valerio 45100*; San José: *Alfaro 120* (*in part*).

EXCLUDED SPECIES

So far as we know, the following citations include all of the concepts originally proposed for the genus *Isochilus*, or wrongly attributed to it, which have subsequently been transferred to other genera.

Isochilus cernuum Lindley in Ann. & Mag. Nat. Hist., ser. 1, 10 (1842) 184 = **Epidendrum Karwinskii** *Reichb.f.*

Isochilus dubius A. Richard & Galeotti in Ann. Sci. Nat., ser. 3, 3 (1845) 23 = **Scaphyglottis livida** (*Lindl.*) *Schltr.*

Isochilus elegans Focke in Tijdschr. Natuurk. Wetensch. 4 (1851) 68 = **Epidendrum stenopetalum** *Hook.*

Isochilus fusiforme Lindley Gen. & Sp. Orch. Pl. (1831) 113 = **Epidendrum fusiforme** (*Lindl.*) *Reichb.f.*

Isochilus globosum (Jacq.) Lindley Gen. & Sp. Orch. Pl. (1831) 112 = **Jacquiniella globosa** (*Jacq.*) *Schltr.*

Isochilus graminifolius HBK. Nov. Gen. & Sp. 1 (1816) 340, t. 78 = **Maxillaria graminifolia** (*HBK.*) *Reichb.f.*

Isochilos graminifolium Sprengel Syst. Veg. 3 (1826) 734=**Dichaea graminoides** (*Sw.*) *Lindl.*

Isochilus graminoides (Sw.) Hooker Exot. Fl. 3 (1823-27) t. 196=**Dichaea graminoides** (*Sw.*) *Lindl.*

Isochilus grandiflorum Lindl. in Bot. Reg. 27 (1841) sub t. 1=**Maxillaria Haenkei** *Correll nom. nov.* (*Camaridium grandiflorum* Schltr. in Fedde Repert. Beih. 9 (Sept. 1921) 165, non Ames in Proc. Biol. Soc. Wash. 34 (Dec. 1921) 149).

Since *Maxillaria* and *Camaridium* are considered congeneric, *Camaridium grandiflorum* is invalidated. Furthermore, the prior use of the combination *Maxillaria grandiflora* by Lindley necessitates a new name for this species. The name proposed, *M. Haenkei*, is in honor of its collector.

Isochilus lancifolium (Presl) Lindley Gen. & Sp. Orch. Pl. (1831) 113=**Elleanthus lancifolius** *Presl.*

Isochilus linifolium (Presl) Lindley Gen. & Sp. Orch. Pl. (1831) 113=**Elleanthus linifolius** *Presl.*

Isochilus lividum Lindley in Bot. Reg. 25 (1839) Misc. p. 36=**Scaphyglottis livida** (*Lindl.*) *Schltr.*

Isochilus prolifer R. Brown in Aiton Hort. Kew., ed. 2, 5 (1813) 209=**Scaphyglottis prolifera** (*R. Br.*) *Cogn.*

Isochilus proliferum (R. Br.) Lindley Gen. & Sp. Orch. Pl. (1813) 113, excl. syn. Swartz=**Scaphyglottis prolifera** (*R. Br.*) *Cogn.*

Isochilos ramosum (Jacq.) Sprengel Syst. Veg. 3 (1826) 734=**Epidendrum ramosum** *Jacq.*

Isochilus ramosus Focke in Tijdschr. Natuurk. Wetensch. 4 (1851) 69=**Epidendrum strobiliferum** *Reichb.f.*

Isochilus teretifolium (Sw.) Lindley Gen. & Sp. Orch. Pl. (1831) 112=**Epidendrum teretifolium** *Sw.*

II. THE IDENTITY OF MORMODES LINEATUM AND M. HISTRIO

In publishing the original description of *Mormodes lineatum* Batem. in 1841, Lindley wrote that the plant was "a native of Guatemala, whence it had been sent by both Mr. Skinner and Mr. Hartweg." The species was described as having "dull olive-green flowers, striped and spotted with dull brown." The linear, fleshy, sparsely pilose, incurved lip was described as having a tooth on each side near the base which varied in length from "half a line to two lines," approximately one to four millimeters long.

A year later, 1842, a plant was illustrated as *M. lineatum* in the Botanical Register (Vol. 28, t. 43). The flowers of this plant were apparently so different from the flowers described the year before that Lindley wrote at the time, "The flowers, when they first appeared, were dull olive green, and by no means handsome; they have since acquired a bright warm tint, and the markings upon them have increased in intensity till they have become quite ornamental." The densely pilose lip of the flowers, instead of having a small tooth on each side near the base (as given in the original description), is clearly shown as prominently three-lobed; the twisted lateral lobes being nearly as long as the mid-lobe. It is evident that the plant illustrated as *M. lineatum* was not the same species as that originally described as *M. lineatum.*

In 1859, Linden and Reichenbach filius described *M. histrio* from Mexico. The flowers, which were said to be similar to those of *M. lineatum* (a statement apparently based on the illustration in the Botanical Register), were described as having purplish sepals and petals and a yellow lip. The lip was described as smooth and three-lobed. The lateral lobes were said to be falcate and twisted; the mid-lobe linear and acute.

An examination of an analytical drawing in the Ames Herbarium of a specimen of *M. histrio* from the Reichenbach Herbarium shows flowers which, except for the lack of pilosity on the lip (a character of no diagnostic value because of its variability), are identical with those illustrated as *M. lineatum* in the Botanical Register. The twisted lobes of the lip are nearly as long as the mid-lobe.

From the above it would seem that Bateman's description of *M. lineatum* must have been based on either the Skinner or the Hartweg collection, but not on both; the following year the other collection, an entirely different species, produced flowers and was forthwith illustrated but erroneously designated as *M. lineatum*. This plant was in reality the species later described as *M. histrio*.

It may be concluded that the plant illustrated in the Botanical Register should be known as *M. histrio* rather than *M. lineatum*. Also, specimens which in the past have been attributed to *M. lineatum*, based on this illustration, are in reality *M. histrio*. It is necessary for one to go back to Bateman's original description to obtain a clear conception of the true *M. lineatum*.

A recent collection from Guatemala *(Steyermark 39868)* was found to have flowers whose lip (fig. 1) is identical in shape with that originally ascribed to *M. lineatum*. So far as we know, this is the only collection of this species since it was originally described one hundred years ago. It is evidently endemic to Guatemala where it is extremely rare, while *M. histrio*, also quite rare, occurs in Mexico, Guatemala and Honduras.

Mormodes lineatum *Bateman ex Lindley* in Bot. Reg. 27 (1841) Misc. p. 52.

GUATEMALA—Guatemala: Guatemala City, alt. 1600 meters, cultivated in the garden of Don Mariano Pachecho Dec. 29, 1939, *J.*

A. Steyermark 39868 (Herb. Ames, Herb. Field Mus.). (It is assumed that this plant was obtained in nature from some part of Guatemala).

Mormodes histrio *Linden & Reichenbach filius* in Hamb. Gartenz. 15 (1859) 54.

Mormodes lineatum Lindley in Bot. Reg. 28 (1842) t. 43 (only as to plate, not as to description).

Mexico—Chiapas: Soconusco system, above Huixtla, on decaying tree trunk, open space in humid forest, sepals and petals claret brown, lip brown-vinaceous, underneath olive-green, plant 1 foot high, 18 internodes, about 1000 meters altitude, *O. Nagel 4374* (Herb. Ames); Mt. Ovando, at 1250-2370 meters altitude, July 1938, *E. Matuda 2578* (Herb. Univ. Michigan).

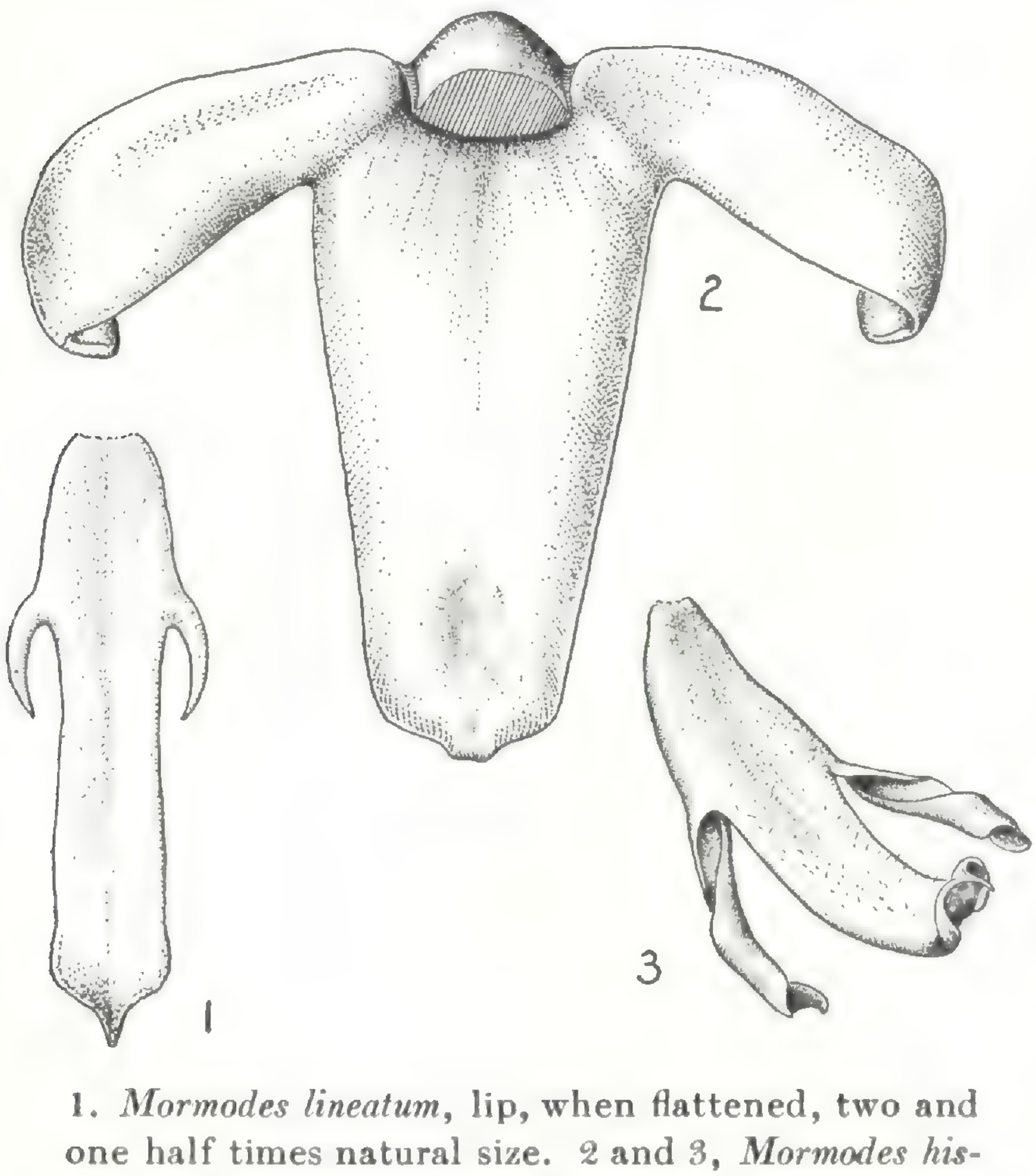
Guatemala—Sacatepéquez: On log, sepals maroon, lip green and white, large elongate bulbs, Barranco Hondo, lower slopes of Volcán de Fuego, altitude about 1800 meters, Dec. 16, 1938, *P. C. Standley 60258* (Herb. Ames, Herb. Field Mus.).

Honduras—Comayagua: Siguatepeque, epiphyte, open mountain forest, petals and sepals wine color, lip yellow, column pale green, 3700 feet altitude, Jan. 30, 1933, *J. B. Edwards 359* (Herb. Ames); Siguatepeque, epiphyte, open pine forest, sepals light green with heavy dark purple stripes and dots, petals light green with fewer dark purple stripes and dots, lip yellow with few purple dots and covered with minute yellow hairs, column yellow, 3700 feet altitude, Oct. 9, 1932, *J. B. Edwards 281* (Herb. Ames).

III. EVIDENCES OF FLORAL POLYMORPHISM IN THE GENUS MORMODES

The flowers in the genus *Mormodes* have long been known to be exceedingly variable in color and size. Recently two collections of *M. histrio* were noted which much more definitely establish the existence of floral polymorphism in the genus. A collection from Honduras (*Edwards 359*) has flowers on the same raceme which differ in size, texture, shape and the presence or absence of hairs on the lip. The smallest flowers are somewhat fleshy and have densely pilose lips. The medium-sized flowers are subcoriaceous and have smooth lips. (The lip illustrated in figure 3 is taken from a flower somewhat

intermediate between the smallest and medium-sized flowers and may be considered as typical of *M. histrio*). The largest flowers on the raceme are rigidly coriaceous and might well be taken for those of an entirely different species. The lateral lobes of the lip (fig. 2) are rigidly divaricate and scarcely or not at all twisted but merely slightly rolled up at the apex. This same collection also has racemes composed of flowers of only one type, either the largest or the smallest. A collection from Guatemala (*Standley 259*) also shows similar evidences of floral polymorphism but has only large and small flowers on the same raceme.



1. *Mormodes lineatum*, lip, when flattened, two and one half times natural size. 2 and 3, *Mormodes histrio*, two types of lip taken from the same raceme, natural position, two and one half times natural size.

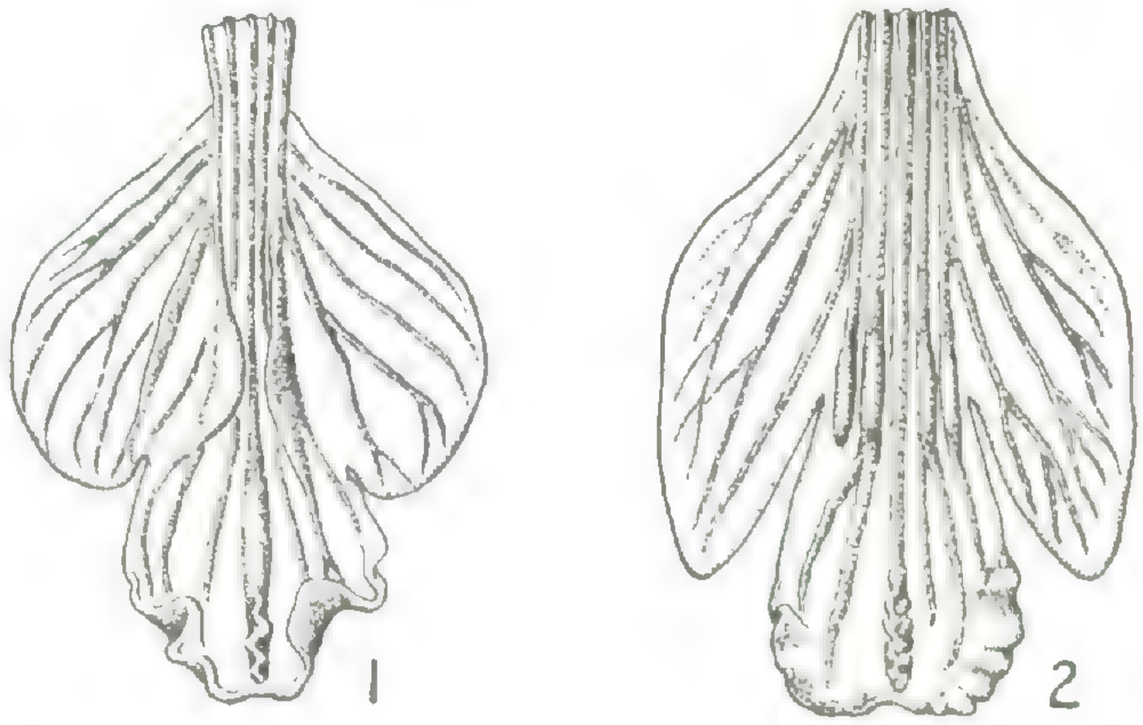
Drawn May 1941 by G. W. Dillon

IV. ANOTHER HEXALECTRIS FROM MEXICO

The first described species of *Hexalectris*, *H. spicata* (Walt.) Barnh., occurs from West Virginia (Pendleton County), Maryland and Virginia, south to Sarasota County, Florida and west to Indiana, Kentucky, Missouri, Arkansas, Arizona, New Mexico and Mexico, where it was recently discovered in the State of Nuevo Leon. The second described species, *H. mexicana* Greenm., occurs in western Texas and generally throughout Mexico.

Recently my colleague, Dr. L. O. Williams, described two new species from Mexico, *H. parviflora* and *H. brevicaulis* (Amer. Orch. Soc. Bull. 9, (1940) 125, t.).

The species in question, *Hexalectris revoluta*, is most closely related to *H. spicata*. It is a large plant bearing comparatively few distant flowers. When the flowers are fully expanded the sepals and petals are conspicuously revolute, often being tightly rolled back a third or more of their length. As shown by the figures, the lip (fig. 2) is distinctly different in the shape and lobing from that of *H. spicata* (fig. 1). Although the lamellation of the lip is somewhat similar in the two species, it is not so prominent in *H. revoluta*. Instead of five prominent keels at the base of the middle lobe as in *H. spicata*, the lip of *H. revoluta* has four keels which are only slightly raised.



1. *Hexalectris spicata*, lip, spread out, taken from a typical plant from Florida, two and one half times natural size. 2. *Hexalectris revoluta*, lip, spread out, two and one half times natural size.

Drawn May 1941 by
G. W. Dillon

Hexalectris revoluta *Correll sp. nov.*

Herbae erectae, saprophyticae. Caules simplices, nudi, robusti, bracteati. Inflorescentia racemosa, pauciflora. Bracteae inflorescentiae ovatae, acutae, concavae. Sepala et petala apice conspicue revoluta. Sepalum dorsale oblongo-ellipticum, obtusum. Sepala lateralia obliqua, elliptica vel elliptico-lanceolata, obtusa vel subacuta, rare retusa. Petala obliqua, elliptica vel elliptico-obovata, obtusa. Labellum in circuitu late ellipticum, profunde trilobatum, basi late cuneatum; lobi laterales oblongi, obtusi; lobus medius obovato-cuneatus, apice truncatus vel retusus, margine superiore undulato et nervo medio incrassato; lamina prominenter nervosa nervis plusminusve carinatis, lamellis quatuor parvis in lobi medii basi ornata. Columna generis.

Plant saprophytic, erect from a fleshy rhizome, 3–4.5 dm. tall. Stems stout, simple, aphyllous, provided with several short broad clasping bracts, apparently purplish in color. Inflorescence a few-flowered raceme, with as many as twelve flowers, up to 20 cm. long. Floral bracts broadly ovate, acute, concave, 1–1.4 cm. long. Flowers with rather stout pedicellate ovaries which are about 1.5 cm. long. Sepals and petals conspicuously revolute at the apex. Dorsal sepal oblong-elliptic, bluntly obtuse, concave, 1.6–2.1 cm. long, 6–7 mm. wide. Lateral sepals oblique, elliptic to elliptic-lanceolate, obtuse to subacute or rarely minutely retuse at the apex, 1.5–2 cm. long, 6.5–7.5 mm. wide. Petals oblique, elliptic to elliptic-obovate, bluntly obtuse, 1.5–1.9 cm. long, 6–7.5 mm. wide. Lip broadly elliptic in outline, deeply 3-lobed, broadly cuneate at the base, 1.4–1.8 cm. long, 9–13 mm. wide across the lateral lobes; lateral lobes oblong, obtuse, free part 5–6 mm. long and 3.5–4.5 mm. wide; mid-lobe obovate-cuneate, truncate or retuse at the apex, upper margin undulate, with the central nerve prominently

thickened above, 7–8.5 mm. long, 5–6 mm. wide across the apex; lamina prominently nervose, with all the nerves more or less raised and thickened, adorned with four small somewhat equal lamellae at the base of the mid-lobe. Column clavate, arcuate, about 1.5 cm. long.

Mexico—Nuevo Leon: Sierra Madre Oriental, lower San Francisco Canyon, about 15 miles S. W. of Galeana, alt. 7500-8000 ft., sparse in open oak wood, June 10, 1934, *C. H. & M. T. Mueller 767* (Type in Herb. Ames No. 40617); Sierra Madre Oriental, Canyon above Alamar, about 15 miles S. W. of Galeana, alt. 5000-6000 ft., common in moist open wood, June 2, 1934, *C. H. & M. T. Mueller 700* (Herb. Ames No. 40619); Sierra Madre Oriental, Canyon de los Charcos y Mesa de la Camisa, above Alamar, about 15 miles S. W. of Galeana, rare in open oak wood in the upper canyon, June 4, 1934, *C. H. & M. T. Mueller 733* (Herb. Ames No. 40618).

The following key is included for convenience in identifying all of the known species of *Hexalectris*.

1. Petals linear-oblanceolate, less than 2.3 mm. broad; lip less than 7 mm. broad

Hexalectris parviflora

1. Petals elliptic-oblanceolate to elliptic-obovate, 3.5 mm. or more broad; lip more than 8 mm. broad
   2. Lateral sepals more than 2.3 cm. long; lip thickened along the median line and with radiating costae

Hexalectris brevicaulis

   2. Lateral sepals less than 2 cm. long; lip lamellate
      3. Lip shallowly 3-lobed; lateral lobes of lip broadly rounded with the free part less than 2 mm. long

Hexalectris spicata

      3. Lip deeply 3-lobed; lateral lobes oblong to elliptic with the free part more than 3 mm. long
         4. Sepals and petals strongly revolute; lip tapering at the base, the lamina longer than broad

Hexalectris revoluta

         4. Sepals and petals spreading, not strongly revolute; lip with a slender claw, the lamina about as broad as long or broader

Hexalectris mexicana

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CAMBRIDGE, MASSACHUSETTS, JULY 31, 1941 VOL. 10, NO. 2

A NEW SPECIES OF ASPASIA FROM PANAMA

BY
CHARLES SCHWEINFURTH

IN the course of identifying an interesting collection of orchids from Darien Province, Republic of Panama, the following noteworthy species of Aspasia was discovered.

Aspasia pusilla *C. Schweinfurth sp. nov.*

Herba epiphytica, pusilla. Caules congesti, supra pseudobulbosi, parte basali vaginis distichis conduplicatis imbricatis vestiti. Pseudobulbi valde complanati, saepissime plusminusve ellipsoidei, unifoliati. Folium lineare vel lineari-ellipticum, acutum, subsessile, in sicco valde chartaceum. Inflorescentia lateralis, brevis, laxe pauciflora. Flores pro genere parvi. Sepalum dorsale elliptico-oblanceolatum, acutum. Sepala lateralia elliptico-oblonga, acuta, dorso carinata. Petala sepalo dorsali similia, leviter obliqua. Labellum columnae medio adnatum, patens, suborbiculari-obovatum, marginibus (parte basali cuneata excepta) irregulariter crenulatis. Columna perbrevis, crassa, clinandrio magno concavo denticulato.

Plant epiphytic, small and slender for the genus. Roots fibrous, glabrous, numerous. Stems crowded, consisting of shortly stipitate pseudobulbs of which the slender lower portion and base of the pseudobulb are invested by distichously imbricating conduplicate sheaths,

the upper sheath (on either side of the pseudobulb) being elongate and leaf-bearing; pseudobulbous portion strongly complanate, narrowly cylindric to ellipsoid, unifoliate, up to about 5 cm. long and 1.5 cm. wide in the dried specimen. Leaves linear to linear-elliptic, up to 17.5 cm. long and 1.3 cm. wide, narrowed to an acute apex, cuneate-narrowed to a subsessile base, thickly chartaceous when dried. Inflorescences one or two to a pseudobulb, lateral, short but surpassing the pseudobulb, up to about 9 cm. tall, very loosely 4- to 6-flowered, with the slender rachis more or less flexuous above. Floral bracts broadly ovate, acute, cucullate, spreading, up to 7 mm. long, membranaceous. Flowers very small for the genus, with spreading segments and with subfleshy sepals and petals. Dorsal sepal free, oblanceolate-elliptic, about 13 mm. long and 4.8 mm. wide, acute, 5-nerved, dorsally subcarinate. Lateral sepals elliptic-oblong, about 13.7 mm. long and 4 mm. wide, acute, 5-nerved, dorsally carinate along the middle. Petals similar to the dorsal sepal, obliquely oblong-oblanceolate, sharply acute, about 12.1 mm. long and 4 mm. wide, 3- (or indistinctly 5-) nerved. Lip adnate up to about the middle of the column; suborbicular-obovate in outline, spreading, about 11 mm. long and 12 mm. wide when expanded, broadly cuneate toward the base, lightly retuse at the apex, with irregularly crenulate margins except near the base; lamina slightly concave near the base with a small forcipate pubescent callus. Column short and stout, about 5.7 mm. long at the back, with a pair of prominent porrect obliquely triangular fleshy arms just above the junction with the lip; clinandrium large, with high erect and irregularly denticulate margins. Anther obliquely semiorbicular-conic, papillose. Pollinia two, complanate-ovoid.

Aspasia pusilla is remarkable for its small size and slender proportions. In having a dorsal sepal which is

quite free from the column and a lip with a cuneate base, it simulates the Brazilian *A. lunata* Lindl., but it appears to lack Central American allies.

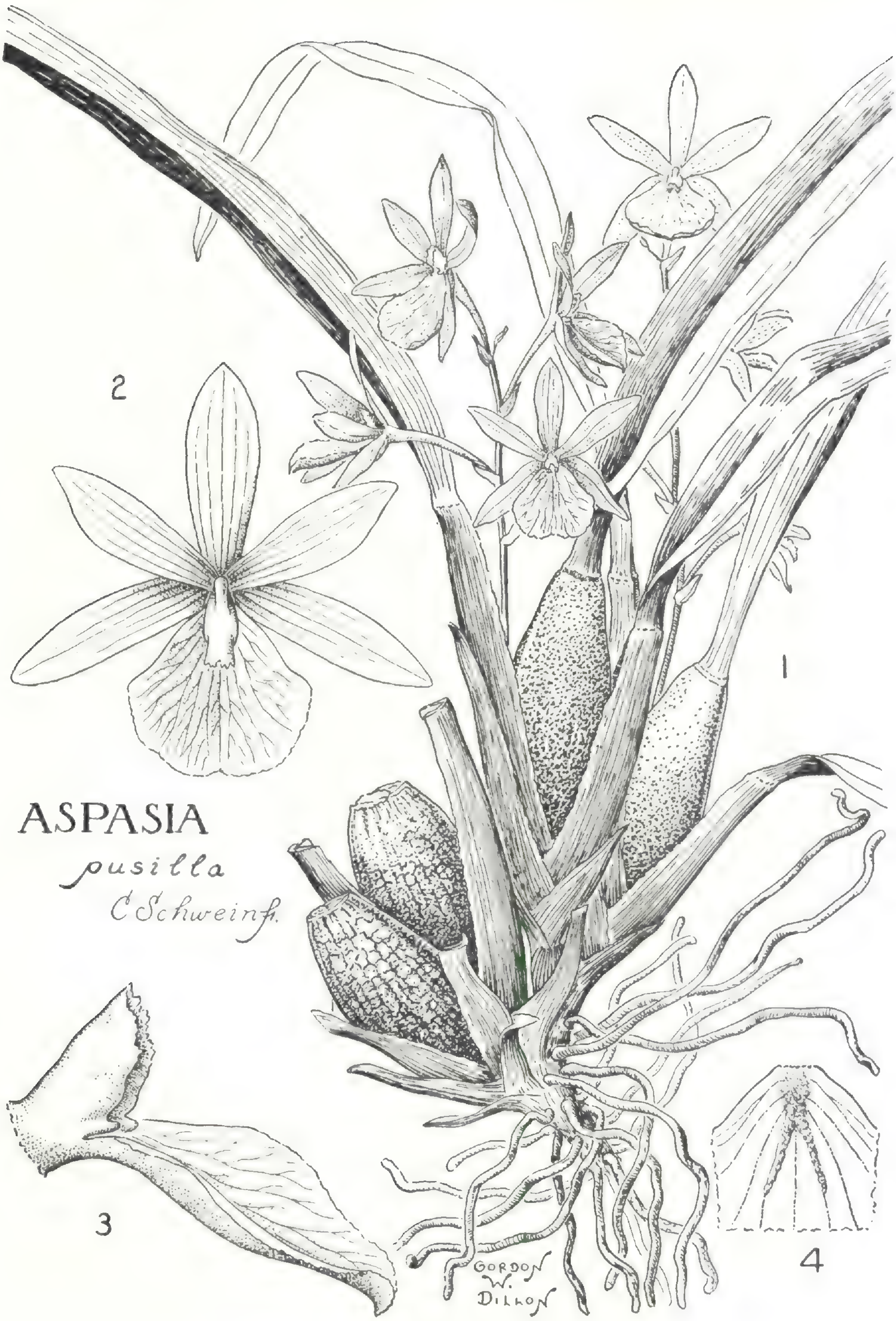
Republic of Panama, Darien Province, Chepigana District, Cana-Cuasi Trail (Camp 2), epiphyte "4 to 8 inches high", at 2000 feet altitude, "outer petals greenish-yellow, maroon spot at base; lip white or yellow centrally gamboge, marked with maroon", March 11, 1940, *M.E. & R.A. Terry 1502* (Type in Herb. Ames No. 59568; Duplicate type in Herb. Field Museum No. 1034500).

EXPLANATION OF THE ILLUSTRATION

ASPASIA PUSILLA *C. Schweinf.* 1, plant, natural size. 2, flower from front, twice natural size. 3, column and lip from side, natural position, four times natural size. 4, basal portion of lip, showing callus, four times natural size.

Drawn May 1941 by G. W. DILLON

PLATE I



NOMENCLATORIAL CHANGES HEXADESMIA TO SCAPHYGLOTTIS

BY

CHARLES SCHWEINFURTH

A study of the concept *Hexadesmia* has convinced us that this genus should not be maintained as distinct from the genus *Scaphyglottis*. The traditional mark of separation between the two genera (and their only point of discrepancy) is that *Hexadesmia* has six pollinia whereas *Scaphyglottis* bears only four pollinia. If this mark of separation appears to anyone to be of generic value, one need only refer to the genus *Pleurothallis* which, in its generally accepted components, has either two or four pollinia.

Accordingly I herewith submit a few new combinations and a new name to transfer some Central American species described as *Hexadesmia* to the concept *Scaphyglottis*.

Scaphyglottis Acostaei *(Schltr.) C. Schweinfurth comb. nov.*

Hexadesmia Powellii Schlechter in Fedde Repert. Beihefte 17 (1922) 27, non Scaphyglottis Powellii *Schlechter* in Fedde Repert. Beihefte 17 (1922) 28.

Hexadesmia Acostaei Schlechter in Fedde Repert. Beihefte 19 (1923) 293.

Except for having slightly more elliptic petals, the concept *Hexadesmia Powellii* appears to be identical with *H. Acostaei*.

Scaphyglottis bifida *(Reichb.f.) C. Schweinfurth comb. nov.*

Hexadesmia bifida Reichenbach filius in Saunders Refug. Bot. 2, pt. 2 (1878) sub t. 113.

Scaphyglottis brachyphylla *(Reichb. f.) C. Schweinfurth comb. nov.*

Hexadesmia brachyphylla Reichenbach filius Beitr. Orch. Centr.-Am. (1866) 89.

Hexadesmia brachyphylla var. *longior* Schlechter in Fedde Repert. Beihefte 19 (1923) 205.

Scaphyglottis falcata *C. Schweinfurth comb. nov.*

Hexadesmia falcata C. Schweinfurth in Bot. Mus. Leafl. Harv. Univ. 8 (1940) 45.

Scaphyglottis spathulata *C. Schweinfurth nom. nov.*

Hexadesmia Jimenezii Schlechter in Fedde Repert. Beihefte 19 (1923) 293, non Scaphyglottis Jimenezii *Schlechter* in Beihefte Bot. Centralbl. 36, Abt. 2 (1918) 399.

The material which represents this species is rather sparse and consequently the concept may prove to be referable to another species.

Scaphyglottis stenotepala *(Reichb.f.) C. Schweinfurth comb. nov.*

Hexadesmia stenotepala Reichenbach filius in Bonpl. 3 (1855) 221, and in Xenia Orch. 1 (1856) 169, t. 59, fig. II, 4-5.

NOMENCLATORIAL CHANGES IN SPECIES OF SPIRANTHES FOUND IN PERU

BY

CHARLES SCHWEINFURTH

The following nomenclatorial changes have been found advisable in studying the Spiranthinae recorded from Peru.

Spiranthes laxa *(Poepp. & Endl.) C. Schweinfurth comb. nov.*

Stenorrhynchus laxus (as Stenorrhynchos laxum) Poeppig & Endlicher Nov. Gen. ac Sp. 2 (1837) 7, t. 109—Cogniaux in Mart. Fl. Bras. 3, pt. 4 (1895) 172.

Pelexia laxa Lindley Gen. & Sp. Orch. Pl. (1840) 482.

Since it seems advisable, from the viewpoint of simplicity, to follow Bentham & Hooker f. in including the concept Stenorrhynchus in the older genus Spiranthes, a new combination must be made.

Spiranthes Lechleri *C. Schweinfurth comb. nov.*

Brachystele Lechleri Schlechter in Fedde Repert. Beihefte 9 (1921) 59—Schlechter ex Mansfeld in Fedde Repert Beihefte 57 (1929) t. 107, nr. 421.

Since the genus *Brachystele* Schltr. is considered to be inseparable from the polymorphic *Spiranthes*, the concept *B. Lechleri* is herewith transferred to the latter genus.

In some Peruvian collections *(Macbride & Featherstone 1224, 1589, 2273)* which are referable to this species, there are often present clusters of very stout tuberoid roots; the height of the plant sometimes exceeds 4 dm. and at most the floral bracts only slightly exceed the flowers. Moreover, the flowers which are slightly larger than those of the type, are designated as bright to deep golden yellow, and the mid-lobe of the lip is commonly

transversely oblong or oval-oblong and retuse-apiculate rather than "suborbicular." The dates of collection extend from June 16 to August 21, 1922.

Spiranthes maculata *C. Schweinfurth comb. nov.*

Pelexia maculata Rolfe in Kew Bull. (1893) 7—Summerhayes in Bot. Mag. 158 (1935) t. 9418.

In accordance with our plan of simplification, the genus Pelexia is referred to Spiranthes and a new combination is thus necessitated.

Although the habitat was cited as "not recorded" in the original diagnosis and was later cited by Summerhayes as questionably from Venezuela, we have seen a definitely localized collection from the Herbarium of the Field Museum. The data are as follows:

PERU: La Merced, at about 600 meters altitude, edge of mountain stream, leaves mottled with lighter green, flowers "white tipt, slightly reddish without", August 10-24, 1923, *J. Francis Macbride 5526*.

This Peruvian collection differs from the type in having somewhat larger leaves which are up to about 18 cm. long and 8.5 cm. wide.

Spiranthes Rimbachii *(Schltr.) C. Schweinfurth comb. nov.*

Cyclopogon Rimbachii Schlechter in Fedde Repert. Beihefte 8 (1921) 166.

The transfer of this concept to the genus Spiranthes requires a new combination.

A Peruvian collection of this species has been recently examined. It differs from the Ecuadorian type in the following particulars: one plant reaches about 6 dm. in height (in contrast to a maximum height of 5 dm.), one plant bears six basal leaves and another specimen bears eight cauline sheaths (in contrast to a maximum of four). The lip is slightly broader than that of the type and is about 7 mm. wide.

Ayacucho: Prov. Huanta, Choimacota Valley, at 2900-3000 meters altitude, in shady places in evergreen bush-wood, flowers reddish-white, February 28-March 10, 1926, *A. Weberbauer 7575*.

Spiranthes subumbellata *C. Schweinfurth nom. nov.*

Synassa corymbosa Lindley in Bot. Reg. 19 (1833) sub t. 1618.

Pelexia corymbosa Lindley Gen. & Sp. Orch. Pl. (1840) 482—Kränzlin in Engler Bot. Jahrb. 54, Beibl. 117 (1916) 19.

The inclusion of this species in the genus Spiranthes necessitates a new specific epithet, since the name *corymbosa* has already been used in the genus Spiranthes (S. corymbosa *Kränzl.* in Engler Bot. Jahrb. 54, Beibl. 117 (1916) 17.

Spiranthes vaginata "*Lindl.*" *ex Jackson* in Ind. Kew. (1895) 967.

Neottia vaginata Humboldt, Bonpland & Kunth Nov. Gen. et Sp. 1 (1816) 331—Lindley Gen. & Sp. Orch. Pl. (1840) 472.

Stenorrhynchus vaginatus Sprengel Syst. Veg. 3 (1826) 710.

In Index Kewensis (1895) p. 967, the authorship of this species was attributed to Lindley (Gen. & Sp. Orch. Pl. (1840) 472), and this citation has been continued by various authors subsequently.

However, this concept was cited by Lindley (l.c.) as "Neottia vaginata" and included as No. 32 among a long list of Spiranthes species with the preceding caption "To this section [of Euspiranthes] probably belongs" [this species]. So, while Lindley's obvious intention was to regard the species as a member of the genus Spiranthes, the fact remains that the combination was not specifically made by him. Consequently the citation should be given as above.

NOMENCLATORIAL NOTES AMONG SOUTH AMERICAN ORCHIDS

BY

CHARLES SCHWEINFURTH

During my intensive studies of the orchids of Peru, I have found the following nomenclatorial transfers to be necessary.

Malaxis carnosa *(HBK.) C. Schweinfurth comb. nov.*

Stelis carnosa Humboldt, Bonpland & Kunth Nov. Gen. et Sp. 1 (1816) 362.

Dienia calycina Lindley Gen. & Sp. Orch. Pl. (1830) 23.

Ophrys monophyllos Pavon ex Lindley Gen. & Sp. Orch. Pl. (1830) 23, *in synon.*

Microstylis gracilis Ridley in Journ. Linn. Soc. 24 (1888) 321.

Microstylis calycina Ridley in Journ. Linn. Soc. 24 (1888) 331.

Serapias parasitica Pavon ex Ridley in Journ. Linn. Soc. 24 (1888) 331, *in synon.*

Malaxis calycina O. Kuntze Rev. Gen. Pl. 2 (1891) 673.

Malaxis gracilis O. Kuntze Rev. Gen. Pl. 2 (1891) 673.

Microstylis monticola Schlechter in Fedde Repert. 3 (1906) 17.

Microstylis microtoides Schlechter in Beihefte Bot. Centralbl. 36, Abt. 2 (1918) 381.

Malaxis monticola Ames in Proc. Biol. Soc. Wash. 35 (1922) 84.

A photograph of the type of *Stelis carnosa* together with two flowers from the specimen in the Muséum d'Histoire Naturelle at Paris show that this concept rep-

resents the widely distributed Middle American species of Malaxis which has borne the several names cited above, as discussed in Bot. Mus. Leafl. Harv. Univ. 3 (1935) 114.

Stelis carnosa was cited from Prov. Jaen de Bracamoros near Sondorillo and Mandor Rock, at about 6000 feet altitude, *Bonpland s.n.* As *Microstylis calycina*, it was cited from Peru (Pavon) by Ridley (l.c.) Furthermore, it was listed from the Department of Amazonas (Peru) by Schlechter in Fedde Repert. Beihefte 9 (1921) 135.

Malaxis termensis *(Kränzl.) C. Schweinfurth comb. nov.*

Microstylis termensis Kränzlin in Fedde Repert. 1 (1905) 91.

This Peruvian species should be referred to the earlier genus Malaxis.

It is apparently widely distributed in Peru, being found in the departments of Ayacucho, Cuzco, Huánuco and Junín.

Liparis elegantula *Kränzlin* in Engler Bot. Jahrb. 37 (1906) 382.

Liparis Millei Schlechter in Fedde Repert. 15 (1917) 53.

After a careful comparison of the original descriptions of these concepts, supplemented by an excellent photograph of the type of *L. elegantula* and a floral analysis of *L. Millei* made under the direction of Dr. Schlechter, it is certain that they are conspecific. Indeed, the only significant difference is that the leaves of *L. Millei* from Ecuador are described as broadly elliptic, while those of the Peruvian *L. elegantula* are broadly ovate or triangular-ovate and attain a slightly greater width.

Liparis ramosa *Poeppig & Endlicher* Nov. Gen. ac Sp. 2 (1837) 9, t. 112.

Liparis Rusbyi Rolfe in Bull. N. Y. Bot. Gard. 4 (1907) 454.

A comparison of the Bolivian species *L. Rusbyi*, as represented by a photograph of the type, with the Peruvian *L. ramosa*, as shown by the plate of the type (l.c.), indicates that the two concepts are inseparable. *Liparis Rusbyi* appears to have somewhat larger flowers than those of the Peruvian collections referred to *L. ramosa*.

Masdevallia auropurpurea *Reichenbach filius et Warscewicz* in Bonpl. 2 (1854) 115—Woolward The Genus Masdevallia pt. 8 (1896) t.

Masdevallia Herzogii Schlechter in Fedde Repert. Beihefte 10 (1922) 42—Schlechter ex Mansfeld in Fedde Repert. Beihefte 57 (1929) t. 137, nr. 536.

Masdevallia xanthura Schlechter in Fedde Repert. 27 (1929) 39.

A comparison between *M. auropurpurea*, of which we have authentic material, and the Bolivian *M. Herzogii* (illustrated by a floral analysis of the type) shows that the concepts are synonymous. Kränzlin, in his monograph of Masdevallia (in Fedde Repert. Beihefte 34 (1925) 123), regards this concept as a synonym of *Masdevallia brachyura* Lehm. & Kränzl. which he keeps separate from *M. auropurpurea*. We have seen no good material of *M. brachyura*. However, it seems probable that it may prove to be merely a small form of *M. auropurpurea*.

Furthermore, it appears that *M. xanthura* differs from *M. auropurpurea* only in having longer tails to the sepals and in having yellow and violet, instead of yellow and brown, flowers. The bilobulate apex to the petals found in this concept also occurs in *M. auropurpurea*. It therefore seems unjustifiable to maintain *M. xanthura* as a distinct species.

The range of *M. auropurpurea* consequently extends from Colombia, through Ecuador to Bolivia.

Stelis Endresii *Reichenbach filius* in Gard. Chron. (1870) 1373.

Stelis parvibracteata Ames in Orchidaceae 7 (1922) 131.

Stelis glandulosa Ames in Sched. Orch. 3 (Jan. 30, 1923) 3.

Stelis propinqua Ames in Sched. Orch. 6 (Nov. 3, 1923) 55.

Stelis praesecta Schlechter in Fedde Repert. Beihefte 19 (Nov. 25, 1923) 175.

Stelis violascens Schlechter in Fedde Repert. Beihefte 19 (Nov. 25, 1923) 176.

Stelis Huebneri Schlechter in Beihefte Bot. Centralbl. 42, Abt. 2 (1925) 88.

Stelis Endresii appears to be a widely variable species which extends through Middle America from Mexico and Guatemala to Panama, and in South America in Brazil and Peru. Its variability appears in vegetative size (plants up to about 24 cm. high), in the form of the leaf which ranges from elliptic-ligulate with a distinct petiole to oblanceolate with a gradually narrowed base, and in the size of the flowers. Of these the sepals appear to be either equal or slightly unequal in size and to be more or less distinctly papillose within. Sometimes the flowers are pinkish, as in *S. parvibracteata* (instead of the typical shade of greenish or whitish). The sepals are often conspicuously glandular within, as in *S. glandulosa*. Sometimes the flowers appear to be larger than usual with the dorsal sepal 5-nerved, as in *S. propinqua*. *Stelis praesecta* and *S. violascens* are described as having glabrous flowers which are wine-red or red-violet. The South American *S. Huebneri* has a leaf that is oblanceolate and gradually

narrowed below, without the distinct petiole often seen in Central American specimens.

Stelis floribunda *HBK*. Nov. Gen. et Sp. 1 (1816) 362.

Stelis apiculata Schlechter in Fedde Repert. Beihefte 7 (1920) 84; Schlechter ex Mansfeld in Fedde Repert. Beihefte 57 (1929) t. 28, nr. 105, non Lindl. 1858.

Stelis insignis Ames in Sched. Orch. 1 (1922) 5.—*C. Schweinfurth* in Bot. Mus. Leaff. Harv. Univ. 3 (1934) 43.

The receipt of an excellent photograph of the type of *Stelis floribunda* and some of the dried flowers of this specimen from the Muséum d'Histoire Naturelle at Paris show beyond question that it includes the concept described as *S. insignis* Ames.

The latter species diverges from *S. floribunda* in its somewhat greater vegetative size—the stems are up to about 19 cm. tall (contrasted with a maximum of about 10 cm. in *S. floribunda*); the leaf-blade is up to about 13 cm. long and 3.5 cm. wide (contrasted with a length of about 8.2 cm. long and a width of about 2.9 cm. wide in *S. floribunda*). Its sepals also vary from obtuse to subacute.

It appears that the shape of the typical leaf of *S. floribunda* is oblong-elliptic, but a Colombian collection (*Lehmann 6921*), which is correctly referred to that species by Kränzlin, has leaves varying from narrowly elliptic-oblong to narrowly oblong.

A series of Peruvian collections referable to *S. floribunda* differ from the typical form in having leaves which sometimes attain a width of 4 cm., in having commonly but a single inflorescence instead of two to four in a cluster, and in having flowers which are described as greenish white instead of violet (as cited for *S. floribunda*).

In addition to the Colombian specimens mentioned, the following Peruvian collections should be cited:

Dept. Ayacucho: Ccarrapa, between Huanta and Río Apurimac, at 1000 meters altitude, epiphyte on wooded hillside, May 5, 6, 17, 1929, *E. P. Killip & A. C. Smith 22484*; Aina, between Huanta and Río Apurimac, at 750-1000 meters altitude, epiphyte in dense forest, May 7, 17, 1929, *Killip & Smith 22773, 22776*.—Dept. Junín: Huacapistana, at about 1800 meters altitude, epiphyte in densely forested valley, June 6, 1929, *Killip & Smith 24295*.

Stelis purpurea *(Ruiz & Pav.) Willdenow* Sp. Pl. 4 (1805) 140.

Humboldtia purpurea Ruiz & Pavon Syst. Veg. (1798) 235.

Stelis truncata Lindley in Hooker Comp. Bot. Mag. 2 (1836) 353; Fol. Orch. Stelis (1858) 15, no. 115.

Stelis Huancabambae Kränzlin in Engler Bot. Jahrb. 54, Beibl. 117 (1916) 20.

Stelis cordibractea Schlechter in Fedde Repert. Beihefte 8 (1921) 51; Schlechter ex Mansfeld in Fedde Repert. Beihefte 57 (1929) t. 80, nr. 310.

Stelis phaeantha Schlechter in Fedde Repert. Beihefte 9 (1921) 68; Schlechter ex Mansfeld in Fedde Repert. Beihefte 57 (1929) t. 111, nr. 435.

Recently there came to hand an apparently authentic specimen of *Humboldtia purpurea* (=*Stelis purpurea*) from the Ruiz & Pavon collection preserved in Madrid. While this specimen has very imperfect inflorescences, it is otherwise in a serviceable condition and has good flowers.

Stelis truncata, exemplified by a photograph of the type collection, differs from *S. purpurea* only in having proliferous or branched stems and usually (but not always) smaller leaves. However, in the specimen of *Stelis purpurea* above mentioned, there are in the axil of one

of the leaves the fragments of two peduncles of which the much stouter one might well represent a proliferous stem.

Stelis Huancabambae, of which we have seen isotype specimens, has usually slightly narrower leaves than those of *S. purpurea*, while the dorsal sepal is commonly somewhat triangular-ovate and more narrowed above than that of *S. purpurea*,—differences which are inconsequential. Contrary to the description of *S. Huancabambae*, its dorsal sepal is 5- to 7-nerved as in *S. purpurea* and the neuration of the lateral sepals is similar.

Stelis cordibractea, of which we have seen a specimen of the type number, seems to differ from *S. purpurea* only in having shorter stems entirely covered by the sheaths and often thicker leaves.

Stelis phaeantha, represented by the description supplemented by a floral analysis made under the direction of Dr. Schlechter, differs from *S. purpurea*, in having narrower leaves with a longer petiole.

Thus it would seem that the concept *Stelis purpurea* should be considered, like the variable *S. Endresii* Reichb. f. of Central America, as a polymorphic species. Besides Peru, it occurs in Colombia and Ecuador.

The color of the flowers is noted as greenish, greenish red with a greenish yellow center, reddish brown, or dark red.

DICHAEA TRICHOCARPA AND DICHAEA SQUARROSA

BY

LOUIS O. WILLIAMS

FOR MANY YEARS *Dichaea trichocarpa* has been the name applied to a common species of Mexican Dichaea which, in 1840, Lindley had described as *Dichaea squarrosa*. Fr. Kränzlin, in his monograph of the genus, in 1923, placed the two species together.

Lindley originally described *Dichaea squarrosa* from a specimen collected by Th. Hartweg at "Mountain of Tuguila" in June. The locality is not known to me, but Hartweg was in Mexico in June 1837 and June 1838. In June 1837, he was probably either in the present state of Guanajuato or in Jalisco. In June 1838, he was probably in Michoacán.

A photograph of the Hartweg specimen (in Lindley's herbarium) is in the Ames Herbarium. Three other specimens were subsequently added to the sheet which contains the type, two from Cuba and one from Mexico. In one corner of the sheet an analytical drawing of a flower has been added. The drawing seems to represent *Dichaea trichocarpa* and was possibly made from one of the Cuban specimens.

Lindley's original description of *Dichaea squarrosa* is rather inadequate, but he does mention that the flowers are large for the genus and apparently white,—both statements being true when applied to the species of the Pacific slope in Mexico but hardly true of the small-flowered *D. trichocarpa* of the West Indies and Central America.

Dichaea trichocarpa (the small-flowered species) is not known to occur on the Pacific slope, that part of Mexico where Hartweg must have collected the type of *D.*

squarrosa. On the contrary there are numerous specimens of *D. squarrosa* from the general region whence Hartweg's specimen might have come. Consequently, on sound morphological characters, I would refer the large-flowered species found on the Pacific slope to *D. squarrosa* and would keep it separate from *D. trichocarpa*.

BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, SEPTEMBER 26, 1941 VOL. 10, NO. 3

NOTES CONCERNING SOME WEST INDIAN ORCHIDS

BY

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I. THE GENUS BROUGHTONIA AND SOME OF ITS ALLIES

IN 1813, Robert Brown proposed the genus *Broughtonia* to include *Dendrobium sanguineum* Sw. (based on *Epidendrum sanguineum* Sw.). He distinguished it from closely allied genera by the long sepaline tube which is adnate to the ovary and by the four pollinia.

In 1853, Lindley proposed the genus *Laeliopsis* based on *Cattleya domingensis* Lindl. He wrote at the time (in Paxton Flow. Gard. 3, p. 155):

"What is the genus of this beautiful plant? LAELIA? no; because it has only four pollen-masses—BROUGHTONIA? no; for although its flower is deeply cuniculate, yet it has not a long external adnate spur and decurrent sepals—EPIDENDRUM? no; for it wants the unguiculate lip more or less united to the column—CATTLEYA? still no; although we once thought it one; for the flowers are membranous, the veins of the lip bearded, and the habit quite different."

Lindley referred three of his own species to this genus (*Laelia Lindenii* (from Cuba), *Broughtonia chinensis* = **Epidendrum chinense** (*Lindl.*) *Ames* and *Epidendrum cubense*) but failed to make the combinations under *Laeliopsis*. He separated *Laeliopsis* from *Broughtonia* primarily on the basis that the flowers lacked a sepaline tube or as he stated, ". . . . a long external adnate spur

and decurrent sepals." Both genera have four pollinia.

Later in the same year (1853), Lemaire proposed the genus *Cattleyopsis* based on *C. delicatula* (". . . originaire des Grandes Antilles (de Cuba ou de St. Domingne?")). He separated *Cattleyopsis* (eight pollinia) from *Broughtonia* and *Laeliopsis* primarily on the number of pollinia, the last two genera characterized by having species with only four pollinia. He did not compare *Cattleyopsis* with *Laelia*. However, it is separated from that genus primarily in that the pollinia are divided into four pairs, each pair having pollinia of unequal size and shape, whereas the pollinia in *Laelia* are all of equal size and proportion. Lemaire made the mistake of showing all of the eight pollinia of *C. delicatula* as being of the same size and shape. He stated that the flowers of this plant were similar to those of *Laeliopsis domingensis*. Actually they simulate those of that species so perfectly that unless one examines the pollinia it is almost impossible for one to separate them. This is especially true of dried specimens.

It is difficult to understand why Lindley placed *Laelia Lindenii* in the genus *Laeliopsis*. It is true that in describing this species, he wrote, "This is probably the same as *Cattleya ? domingensis*." He failed, however, to state the number of pollinia. Nevertheless, he originally placed it in a genus whose species have eight pollinia (*Laelia*), but at the same time he implied that it was possibly referable to a species in a genus whose components have four pollinia (*Cattleya*). Since he finally included *Laelia Lindenii* in *Laeliopsis* (which has four pollinia) we may assume that he believed this concept actually to have had four pollinia. However, it has been included in *Cattleyopsis* (which has eight pollinia) in all later publications, based doubtless on the plate in A. Richard (in Sagra Hist. Cub. Segunda parte, Hist. Nat. 11 (Fl. Cub. Fanerog. 2) (1850) 243, t. 82) where a plant was illustrated as *Laelia*

Lindenii with eight pollinia (actually a side view of a single pair of pollinia is illustrated showing their unequal size and shape). The plant illustrated was apparently the one which was later described by Lemaire as *Cattleyopsis delicatula.*

Several puzzling questions come to mind in regard to the Richard plate. Why, if this plate was incorrect, did Lindley fail to call attention to its inaccuracies? Why did he refer *Laelia Lindenii* to *Laeliopsis* if Richard's interpretation of this concept were correct? Since Richard's plate was published in 1850, three years before Lindley proposed the genus *Laeliopsis*, it seems probable that he must have seen the plate. It is barely possible that Lindley had examined plants of both species (*Cattleyopsis Lindenii* and *Laeliopsis domingensis*), thinking they were the same, and was somewhat confused in his own mind concerning the actual number of pollinia in *Laelia Lindenii.*

The fact remains that Lindley wrongly referred the Cuban plant with eight pollinia (*Laelia Lindenii*) to *Laeliopsis* (four pollinia) after implying that it was the same as *Cattleya domingensis.* The latter species (*Laeliopsis domingensis*) apparently does not occur in Cuba.

In conclusion, it seems best to recognize three genera in this group of allied plants. They may be separated on technical characters as follows:

Flowers with a long sepaline tube adnate to the ovary; leaves coriaceous, with the margins entire; pollinia 4

1. *Broughtonia*

Flowers without a sepaline tube; leaves fleshy-thickened, rigid, with the margins serrate; pollinia 4 or 8

Pollinia 8, in equal pairs

2. *Cattleyopsis*

Pollinia 4, equal

3. *Laeliopsis*

1. **Broughtonia** *R. Brown* in Aiton Hort. Kew. ed. 2, 5 (1813) 217.

This monotypic genus is composed of the following species.

Broughtonia sanguinea *(Sw.) R. Brown* in Aiton Hort. Kew. ed. 2, 5 (1813) 217.

Epidendrum sanguineum Swartz Prodr. Veg. Ind. Occ. (1788) 124.

Dendrobium sanguineum Swartz in Nov. Act. Ups. 6 (1799) 82.

Broughtonia coccinea Hooker in Bot. Mag. 63 (1836) t. 3536.

Viscum radice bulbosa minus, etc. Sloane Cat. Pl. Jam. (1696) 119.

Satyrium parasiticum, etc. P. Brown Civil & Nat. Hist. Jam. (1756) 324.

There is some doubt as to whether this species occurs in Cuba. Acuña (in Estac. Exper. Agrón. Bol. Téc. 60 (Cat. Descr. Orquíd. Cub.) (1939) 107) gives "Guantánamo, Oriente" without any collector. I have seen a Cuban collection (*Wright 3313*) of *Cattleyopsis Ortgiesiana* (labeled *Broughtonia sanguinea* and reported as such by Grisebach Cat. Pl. Cub. (1866) 263) with the above data on the label. Since these two species are superficially so much alike, it may be that Acuña interpreted this collection as *B. sanguinea*. I have not seen any material of this species from Cuba.

According to Gunter (Orch. Zeyl. 4 (1937) 27), this species is found on trees in many parts of Jamaica (where it is apparently endemic), either where the rainfall is heavy or in regions that are dry during a part of the year. It occurs from near sea level up to 2500 feet altitude and the plants, wherever found, grow luxuriantly and produce flowers which vary in color from deep crimson to light pink with purplish veins.

JAMAICA: Port Antonio, near Lynch's Bay, *Britton 887*; Port Morant, *Rothrock 130* (Herb. Field Mus.); Newtown, *Brues*; near Tweedside, So. St. Andrew, *Harris 9020* (Herb. Field Mus.); "Jamaica", *Lehmann B.T. 122*; east of Montego Bay, *Maxon & Killip 1626*; "Jamaica", *Broadway*; "Jamaica", *Cameron*.[1]

EXCLUDED SPECIES

Broughtonia alba Sprengel Syst. Veg. 3 (1826) 735 = **Maxillaria alba** *Lindl.*

Broughtonia ? amoena Wallich ex Lindley Gen. & Sp. Orch. Pl. (1830) 35, *in synon.* = **Otochilus fusca** *Lindl.*

Broughtonia aurea Lindley in Bot. Reg. 26 (1840) Misc. p. 19 = **Cattleya aurantiaca** (*Batem.*) *P.N.Don.*

Broughtonia caudida Otto in Otto & Dietr. Allg. Gartenz. 5 (1837) 411, *sphalm.* in index = **Broughtonia sanguinea** (*Sw.*) *R. Brown?*

Broughtonia chinensis Lindley ex Bentham in Hook. Lond. Journ. Bot. 1 (1842) 492 = **Epidendrum chinense** (*Lindl.*) *Ames.*

Broughtonia fusca Wallich ex Hooker filius Fl. Brit. Ind. 5 (1890) 844, *in synon.* = **Otochilus fusca** *Lindl.*

Broughtonia grandiflora Sprengel Syst. Veg. 3 (1826) 735 = **Maxillaria grandiflora** *Lindl.*

Broughtonia linearis Wallich ex Lindley Gen. & Sp. Orch. Pl. (1830) 42, *in synon.* = **Coelogyne fimbriata** *Lindl.*

Broughtonia maculata Sprengel Syst. Veg. 3 (1826) 735 = **Maxillaria maculata** *Lindl.*

Broughtonia nitida Herb. ex Sweet Hort. Brit. ed. 3 (1839) 641, *nomen* = **Coelogyne** sp.?

Broughtonia pendula Wallich ex Lindley Gen. & Sp. Orch. Pl. (1830) 35, *in synon.* = **Otochilus alba** *Lindl.*

[1]All of the collections cited, unless otherwise indicated, are to be found in the Ames Herbarium or Gray Herbarium, or both.

Broughtonia pilosa Hooker ex Steudel Nomencl. Bot. ed. 2, 1 (1840) 230=**Otochilus** sp.?

Broughtonia tetragona Sprengel Syst. Veg. 3 (1826) 734=**Phaius tetragonus** *Reichb. f.*

2. **Cattleyopsis** *Lemaire* Jard. Fleur. 4 (1853) Misc. p. 59, figs.

If it were not for the unequal pollinia, this genus might well be referred to *Laelia*.

Flowers rather large; lip free or nearly so, tapering or rounded at the base, 2.5 cm. or more long, with the central nerves fringed, undulate-crisped and crenate or coarsely toothed on the margins

1. *C. Lindenii*

Flowers rather small; lip shortly adnate to the column, cordate at the base, mostly less than 2 cm. long, with the central nerves naked, merely wavy on the margins

2. *C. Ortgiesiana*

1. **Cattleyopsis Lindenii** *(Lindl.) Cogniaux* in Urban Symb. Antill. 6 (1910) 544.

Laelia Lindenii Lindley Orch. Lind. (1846) 10.

Cattleyopsis delicatula Lemaire Jard. Fleur. 4 (1853) Misc. p. 59, figs.

Bletia Lindenii Reichenbach filius in Walp. Ann. Bot. 6 (1862) 431.

Laeliopsis Lindenii (Lindl.) "Lindl." ex Cogniaux in Urban Symb. Antill. 6 (1910) 545.

Cattleyopsis Northropiorum Cogniaux in Urban Symb. Antill. 6 (1910) 545.

Cattleyopsis guanensis Acuña in Estac. Exper. Agrón. Bol. Téc. 60 (Cat. Descr. Orquíd. Cub.) (1939) 109.

An examination of a specimen of *C. Northropiorum* (*John L. & Alice R. Northrop 437* in Herb. Gray No. 4257) upon which Cogniaux based (in part) this concept shows that it is referable to *C. Lindenii*. The flowers of this plant have eight pollinia and are similar in all respects to those of the average *C. Lindenii*. Cogniaux (in

Urban, p. 543) furthermore cited a collection from the Bahamas (*Northrop 448*) as *Broughtonia domingensis* and then proposed *Cattleyopsis Northropiorum* as a new species (p. 545) based (in part) on this same collection.

An examination of a photograph of the type of *C. guanensis* in the Ames Herbarium (No. 58601) and a study of the original description reveals that it is referable to this species. The lip has the characteristic crenate-dentate margin of *C. Lindenii.*

In my opinion, this is the plant found in Jamaica and which was reported and illustrated as *Broughtonia domingensis* by Fawcett and Rendle in their *Flora of Jamaica* 1 (1910) 101. Their illustration of the lip and description of the plant (except for the number of pollinia in the generic description) agrees favorably with this species. I consider Gunter's photograph of *Broughtonia lilacina* (Orch. Zeyl. 4 (1937) opposite p. 28) to be referable to this species.

The flowers of this species vary in color from almost white to dark rose-lilac. It is found on trees and shrubs, usually at low elevations.

Bahama Islands: Garden Cay, West End, *Brace 3660* (Herb. Field Mus.); Nicols Town, Andros, *Northrop & Northrop 437*; Fresh Creek, Andros, *Northrop & Northrop 448c/a* (Herb. Field Mus.); Abaco, near Marsh Harbor, *Barbour*; Fresh Creek settlement, Andros Is., *Wight 201-250*; Johnson Bay, Andros Is., *Lowell*; South Bimini, *Millspaugh 2397*. (Herb. Field Mus.).

Cuba: Habana, punta Brava, *Wright 3287* (reported as *Broughtonia domingensis* by Cogniaux in Urban, l.c., p. 543 and as *Laeliopsis domingensis* by Grisebach Cat. Pl. Cub. (1866) 263); "in Cuba Orientali," *Wright 665* (reported as *Broughtonia sanguinea* by Cogniaux in Urban, l.c., p. 542 and by Grisebach, l.c., p. 263); "in Cuba Orientali" *Wright 667* (reported as *Ionopsis utricularioides* by Grisebach, l. c., p. 267 and as *Broughtonia sanguinea* by Cogniaux in Urban, l.c ., p. 542); Pinar del Rio, Guane, *Fors 4837* (Type of *Cattleyopsis guanensis*, photograph seen); Isle of Pines, top of Caballos Mts., *Jennings 230*; Isle of Pines, *Soar.*

Jamaica *Cameron.*

2. **Cattleyopsis Ortgiesiana** (*Reichb. f.*) *Cogniaux* in Urban Symb. Antill. 6 (1910) 546.

Bletia Ortgiesiana Reichenbach filius in Hamb. Gartenz. (1860) 420.

Because of the similarity of the flowers, this species has often been confused with *Broughtonia sanguinea*. However, vegetatively, they are very distinct. The leaves of *C. Ortgiesiana* are very fleshy and rigid and are serrate along the margins, whereas those of *B. sanguinea* are leathery and smooth along the margins. The pseudobulbs are also different in the two species, and the flowers of *C. Ortgiesiana* lack the conspicuous sepaline tube which is characteristic of *B. sanguinea*. The flowers of this species are purple; the sepals and petals usually rose-purple; the lip intensely purple.

This species is apparently endemic to Cuba where it is found on various species of trees in savannas and near the sea coast.

Cuba: Camagüey, north of La Gloria, *Shafer 324*; Camagüey, near Camagüey, *Britton, Britton & Cowell 13143*; Oriente, southeast of Holguin, *Shafer 1295*; Oriente, Guantánamo, *Wright 3313* (reported as *Broughtonia sanguinea* by Cogniaux in Urban, l.c., p. 542 and Grisebach, l.c., p. 263); Santa Clara, Gavilan, *Grey*; Isle of Pines, Loma La Daguilla, *Britton, Britton & Wilson 15165*.

Excluded species

Cattleyopsis rosea Mansfeld in Arkiv. Bot. 20A (1927) 17 = **Epidendrum roseum** *Schltr.* (section Euepidendrum).

3. **Laeliopsis** *Lindley* in Lindley & Paxton Flow. Gard. 3 (1853) 155.

The genus *Laeliopsis* has usually been included in *Broughtonia* on the basis that the number of pollinia is four in each genus. However, vegetatively, they are quite dissimilar. The pseudobulbs of *Broughtonia san-*

guinea are large and ovoid and the leaf is rather thin and smooth along the margin, whereas the pseudobulbs of the species of *Laeliopsis* are usually small and fusiform and the leaves are rigidly fleshy and have sharply serrate margins. The flowers of *Laeliopsis* also lack the sepaline tube which is characteristic of *Broughtonia.*

The species of *Laeliopsis* are very similar, vegetatively, to those of *Cattleyopsis*, and *Laeliopsis domingensis* is superficially so similar in every way to *Cattleyopsis Lindenii* that much confusion has resulted. The similarity of these two species tempts one to unite *Cattleyopsis* and *Laeliopsis.* However, the difference in the number of pollinia would seem to justify keeping them separated.

Lip apiculate, with the margin merely wavy.

1. *L. cubensis*

Lip emarginate, with the margin undulate-fimbriate.

2. *L. domingensis*

1. **Laeliopsis cubensis** (*Lindl.*) "*Lindl.*" *ex Cogniaux* in Urban Symb. Antill. 6 (1910) 543.

Epidendrum cubense Lindley in Bot. Reg. 29 (1843) Misc. p. 17.

Broughtonia cubensis Cogniaux in Urban Symb. Antill. 6 (1910) 542.

The exact status of this concept is not entirely clear and it is not possible to retain it here with complete certainty. However, since Lindley referred this concept to *Laeliopsis* probably it should be retained in that genus. An examination of a photograph of the type in the Ames Herbarium shows that the veins of the lip are ramentaceous as originally described and the lip is shown as broadly elliptic and apiculate. Lindley described the flowers as being "white, with a lip folded up, white at the end, yellow in the middle, and purple, as is the column, near the base."

I have not seen any material of this species. It is apparently restricted to Cuba from whence it was originally collected.

2. **Laeliopsis domingensis** *Lindley* in Lindley & Paxton Flow. Gard. 3 (1853) 155, t. 105.

Cattleya domingensis Lindley Gen. & Sp. Orch. Pl. (1831) 118.

Broughtonia lilacina Henfrey in Moore & Ayres Gard. Mag. Bot. 3 (1851) 201, t.

Broughtonia violacea Hort. ex Moore & Ayres Gard. Mag. Bot. 3 (1851) 201.

Bletia domingensis Reichenbach filius in Walp. Ann. Bot. 6 (1862) 432.

Broughtonia domingensis Rolfe in Gard. Chron. ser. 3, 5 (1889) 491.

As has been stated above, this species is extremely close in habit to *Cattleyopsis Lindenii*. A minor superficial character which seems to be more or less constant and which helps in separating these two entities is that the margin of the lip of *L. domingensis* is usually finely toothed or fringed, whereas the margin of the lip of *C. Lindenii* is commonly crenate or somewhat coarsely toothed. The flowers of this species are usually lilac or purplish, with a few yellow veins in the middle of the lip.

In making the combination, *Broughtonia domingensis*, Rolfe wrote:

> "It has only four pollinia, as Lindley states, though I cannot agree with him as to the absence of the spur. On examining living specimens, I find this organ almost precisely as in *B. sanguinea*."

All of the material of this species which I have examined has no evident sepaline tube. The ovary is often obliquely swollen, giving the impression of a "spur", but there seems to be no extension of the sepals as in *B. sanguinea*. The sepaline tube in *B. sanguinea* is very

conspicuous, with the base usually extended as a short mentum.

This species is apparently endemic to Hispaniola where it is found as an epiphyte on trees and on limestone rocks from near sea level up to 200 meters altitude.

HAITI: Presqu'île du Nord-Ouest, Port-de-Paix, at Saline Michel, *Ekman 3930;* vicinity of La Vallée, Tortue Island, *Leonard & Leonard 15612.*

DOMINICAN REPUBLIC: Barahona, Trujin, *Abbott 1727;* Seibo, La Romana, *Taylor 524;* Cape Samaná, Samaná Peninsula, *Abbott 1185;* Palmarejo, *Eggers 1809.*

EXCLUDED SPECIES

Laelia domingensis Millspaugh in Field Columb. Mus. Bot. 2 (Plantae Utowanae) (1900) p. 32 (Publ. 43), *excl. synon.* = **Epidendrum bifidum** *Aubl.*

At the time he made the combination, *Laelia domingensis*, Millspaugh cited a specimen (supposedly of this species) from Puerto Rico ("Sand dunes and grassy fields near the sea, Cataño and Santurce (277), Porto Rico. Tuber 2-leaved, leaves 18–24 × 4.2 cm., scape nude, whitish, 112 cm. high; flowers, few apical rose colored.") An examination of this specimen shows that it is *Epidendrum bifidum* Aubl.

Laeliopsis chinensis (Lindl.) "Lindl." ex Reichenbach f. in Saunders Refug. Bot. 2 (1882) sub. t. 139, *in synon.* = **Epidendrum chinense** (*Lindl.*) *Ames.*

II. CONCERNING ACUÑA'S CATALOGUE OF CUBAN ORCHIDS

In Acuña's *Catálogo Descriptivo de las Orquídeas Cubanas* seventy-nine genera and two hundred and seventy-two species were included, five of which were invalidly published as new species since they lacked Latin diagnoses. Williams pointed out in his review of the Catalogue (Bot. Mus. Leafl. Harvard Univ. 7 (1939) 181-182) that

although dated "Junio de 1938" the actual date of publication of the Catalogue was possibly about June 5, 1939.

With the intention of validating, if necessary, these proposed new species of Acuña, a study was undertaken of all the available data and a report concerning them is included here. An effort was made in my behalf by Dr. J. P. Carabia to borrow all of the types. In view of his failure to do so, I have had to rely upon photographs of most of the types, along with the original descriptions, in order to arrive at my conclusions. *Hormidium Hiorami* Acuña & Roig (in Mem. Soc. Cubana Hist. Nat. 10 (1936) 51) is also considered in this paper.

Some additional notes concerning some of the other Cuban orchids have been included. Also, any additional distribution data which supplement those given by Acuña are included at the end of the treatment of each species. All of the specimens cited, unless otherwise indicated, are to be found in the Ames Herbarium or in the Gray Herbarium, or both.

Habenaria Brittonae *Ames* in Torreya 12 (1912) 11.

This species, which was originally compared with *H. repens* Nutt., seems to be most closely related to *H. alata* Hook. The pedicellate ovary is crested with a prominent, sharp wing and also has several additional broad ribs without wings, thus placing it in an alliance with *H. alata*. The flowers, except for the constantly 3-lobed lip with short filiform lateral lobes, are similar to those of *H. alata*. The plant differs from *H. alata* not only in the smaller flowers and constantly 3-lobed lip but also in the slenderer and more densely flowered raceme and conspicuously reduced leaves. The raceme of *H. Brittonae* averages less than 1.5 cm. in diameter, whereas that of *H. alata* averages about 3.5 cm. in di-

ameter. The leaves of *H. Brittonae* are little more than reduced, clasping, equitant sheaths, whereas those of *H. alata* are rather large, broad and prominent. The spur of *H. Brittonae* is almost constantly 9 mm. long, whereas the spur of *H. alata* averages about 11 mm. in length.

It is interesting to note that sufficient material of this rare species was recently obtained in Cuba *(Hodge, Howard & Godfrey 4761)* to produce a number of Plantae Exsiccatae Grayanae.

This species is apparently endemic to Cuba.

CUBA: Santa Clara, vicinity of Sopapo, Buenos Aires, Trinidad Mountains, *Smith, Hodgdon & Gonzalez 3343*; Santa Clara, open grassy plateau, Buenos Aires, 20 miles east of Soledad, alt. 3000 ft., plant seldom over 8-10 inches, fls. green, Sept. 9, 1940, *Hodge, Howard & Godfrey 4761.*

Habenaria repens *Nuttall* Gen. No. Amer. Pl. 2 (1818) 190.

Orchis repens Rafinesque Neogenyton (1825) 4, *nomen*, sub Mesicera—Wood in Amer. Bot. & Flor. (1870) 328.

Platanthera repens Wood Class-book of Botany (1861) 685.

Habenaria Nuttallii Small Flora Southeastern U.S. ed. 1 (1903) 315.

Habenaria palustris Acuña in Estac. Exper. Agrón. Bol. Téc. 60 (Cat. Descr. Orquíd. Cub.) (1939) 15.

An examination of a photograph of the type of *H. palustris* in the Ames Herbarium (No. 58600) and a study of the original description reveals that it is referable to *H. repens.*

Habenaria repens grows in ditches, streams, swamps, ponds and on lake shores and is often found on floating weed mats on the surface of the water. It is also found in miry meadows, fresh-water marshes and bogs. The name *(palustris)* implies growing in this type of habitat and

the roots, as shown in the photograph, are produced along a central axis as in *H. repens*.

This species occurs from Virginia to Florida along the Atlantic seaboard, along the Gulf Coast to Louisiana and Texas, throughout Central and South America and the West Indies.

CUBA: Santa Clara, propio de Sto. Tomas, Cienaga de Zapata, July 23, 1920, *Roig & Cremata 2211* (TYPE of *H. palustris*, photograph seen).

Habenaria replicata *A. Richard* in Sagra Hist. Cub. Segunda parte, Hist. Nat. 11 (Fl. Cub. Fanerog. 2) (1850) 250, t. 86.

Acuña (p. 17) included *Habenaria (Gymnadeniopsis) nivea* (Nutt.) Spreng. in his flora, based on a report of this species having been found in Cuba. I have seen no material of this species from outside the United States. The report of its being in Cuba was based on a collection of *H. replicata*, a plant which simulates *H. nivea* very closely in habit. *Habenaria replicata* commonly has a loosely flowered, somewhat secund raceme and a lip which is angled or lobulate near or just below the middle, whereas *H. nivea* commonly has a densely flowered, cylindrical-conical raceme and a lip which is not angled nor lobulate at the middle but is rather dilated above the middle.

It is interesting to note that sufficient material of this rare species was recently obtained in Cuba (*Hodge, Howard & Godfrey 4777*) to produce a set (1038) of Plantae Exsiccatae Grayanae.

This species is apparently endemic to Cuba.

CUBA: Pinar del Rio, Laguna Santa María, *Britton, Britton & Gager 7126*; Pinar del Río, Sierra de Cabra, on Guane Road, *Britton, Britton & Gager 7272*; Santa Clara, abundant on open grassy plateau, Buenos Aires, Trinidad Mountains, 20 miles east of Soledad, Cienfuegos, fls. white, alt. 900 m., Sept. 9, 1940, *Hodge, Howard & Godfrey 4777*; Isle of Pines, McKinley, *Chrysler* (Oberlin College Herb.).

Corymborchis cubensis *Acuña ex Correll* in Bot. Mus. Leafl. Harvard Univ. 8 (1940) 125—Acuña in Estac. Exper. Agrón. Bol. Téc. 60 (Cat. Descr. Orquíd. Cub.) (1939) 51, without Latin diagnosis.

Chloidia flava Grisebach Fl. Brit. West Ind. (1864) 643 (as to description, not as to synonymy).

Corymborchis flava Hemsley *sensu* Cogniaux in Urban Symb. Antill. 6 (1909) 365, *excl. synon.*

A comprehensive treatment of this species may be found in the writer's publication cited above. The species was validated at that time.

Corymborchis cubensis is found in Mexico, Central America and throughout the West Indies.

Cuba: Oriente, Monte Verde, *Wright 1471, 3312*; Oriente, El Yunque, Mt. Baracoa, *Underwood and Earle 685* (Herb. N.Y. Bot. Gard.); Oriente, Farallon de la Perla, *Shafer 8763* (Herb. N.Y. Bot. Gard.); Oriente, side and top of El Yunque, *Shafer 8001* (Type in Herb. N.Y. Bot. Gard.; Isotype in Herb. Ames No. 14353); Oriente, Loma del Gato, Sierra Maestra, *Clement 489* (Herb. N.Y. Bot. Gard.); Pinar del Río, Pan de Gualjaibón, highest mountain of Sierra de los Organos, *Ekman 12753* (U.S. Nat. Herb.).

Malaxis spicata *Swartz* Prodr. Veg. Ind. Occ. (1788) 119.

Microstylis spicata Lindley Gen. & Sp. Orch. Pl. (1830) 19.

Microstylis floridana Chapman Flora Southern U.S. ed. 1 (1860) 454.

Malaxis floridana Kuntze Rev. Gen. Pl., pt. 2 (1891) 673.

Achroanthes floridana Greene in Pitton. 2 (1891) 183.

Malaxis Brittonii Acuña in Estac. Exper. Agrón. Bol. Téc. 60 (Cat. Descr. Orquíd. Cub.) (1939) 57.

An examination of a photograph of the type (extremely poor) of *M. Brittonii* in the Ames Herbarium (No. 58599) and a study of the original description reveals that it is referable to *M. spicata*. The corm and basal

leaf is missing from the type specimen and only a few buds are evident at the apex of the raceme. The floral measurements agree with those of the smallest specimens we have seen of this species from Florida and the West Indies.

This species is found in Virginia, South Carolina, Georgia, Florida, the Bahama Islands and throughout the West Indies.

CUBA: Camagüey, Caobilla, finca "La Ciega," Sept. 2, 1926, *Acuña 4026* (TYPE of *M. Brittonii*, photograph seen); Oriente, *Wright 1696*; Santa Clara, western slopes of Mt. Naranjal above San Blas, Trinidad Mountains, *Smith, Hodgdon & Gonzalez 3244*.

Epidendrum pygmaeum *Hooker* in Bot. Mag. 60 (1833) t. 3233.

Coelogyne ? triptera Brongniart in Duperry Voyage Coquille Phanerog. (1834) 201, t. 42, fig. A, nec *Epidendrum tripterum* Sm., nec *E. tripterum* Lindl.

Epidendrum caespitosum Poeppig & Endlicher Nov. Gen. ac Sp. 2 (1838) 1, t. 101.

Epidendrum uniflorum Lindley in Bot. Reg. 25 (1839) Misc. p. 15.

Epidendrum monanthum Steudel Nomencl. Bot. ed. 2 (1840) 558.

Hormidium uniflorum Heynhold Nomencl. Bot. Nachtr. (1841) 880.

Hormidium pygmaeum Bentham & Hooker filius ex Hemsley in Gard. Chron. n.s. 19 (June 1883) 700 and in Godman & Salvin Biol. Centr.-Am. Bot. 3 (Nov. 1883) 218.

Aulizeum pymaeum "Ldl." ex Stein Orchideenb. (1892) 236, *sphalm, in synon.*

Hormidium tripterum Cogniaux in Martius Fl. Bras. 3, pt. 5 (1898) 29.

Hormidium pseudo-pygmaeum A. Finet in Bull. Herb. Boiss. 7 (1899) 121, t. 3.

Microstylis humilis Cogniaux in Martius Fl. Bras. 3, pt. 6 (1906) 550, t. 114, fig. 4.

? *Hormidium Hiorami* Acuña & Roig in Mem. Soc. Cubana Hist. Nat. 10 (1936) 51.

It has not been possible for me to see the type of *Hormidium Hiorami*. However, a study of the original description convinces me that it is very probably referable to the extremely variable *Epidendrum pygmaeum*. Until it is possible to examine the type or a photograph of the type of *H. Hiorami*, with some reservation it seems best to include it in this species. *Hormidium Hiorami*, was invalidly published since no Latin diagnosis was given by its authors.

This species occurs in southern Florida, Mexico, throughout Central America to Panama, Cuba, Jamaica, Puerto Rico and northern South America.

Epidendrum ramosum *Jacquin* var. **lanceolatum** *Grisebach* Fl. Brit. West Ind. (1864) 614.

Spathiger Roigii Acuña in Estac. Exper. Agrón. Bol. Téc. 60 (Cat. Descr. Orqúid. Cub.) (1939) 93.

An examination of the type of *Spathiger Roigii* (in Herb. New York Bot. Gard.) and a comparison of this material with a sheet in the Gray Herbarium of *Epidendrum ramosum* var. *lanceolatum* (*Wright 3333*, cited by Grisebach Cat. Pl. Cub. (1866) 263) shows that these two plants are identical. The type of *Spathiger Roigii* is also identical with a sheet in the Ames Herbarium (No. 7055) which was compared by Ames with authentic material of *E. ramosum* var. *lanceolatum* at the British Museum.

Variety *lanceolatum* differs from the typical form of the species (and its other varieties) mainly in the type of inflorescence and the somewhat larger flowers. The flowers, instead of being borne in a raceme as in the

other segregates of this species, are borne singly or several in a cluster at the apex of the short lateral branches. Each flower is subtended by several to many closely appressed imbricated bracts and, if clustered, the flowers are borne on separate peduncles. The leaves are usually longer than those of the typical form of the species.

Variety *lanceolatum* occurs as an epiphyte on trees at low elevations.

GUATEMALA: Alta Verapaz, Chamá, pendent, fls. dark reddish brown, hangs down in long festoons, 900 ft. alt., *Johnson 267*.

HONDURAS: Atlantida, near Tela, Lancetilla Valley, *Ames*.

PANAMA: Bocas del Toro, Río Cricamola, between Finca St. Louis and Konkintoe, 10-50 m. alt., *Woodson, Allen & Seibert 1898*.

CUBA: Pinar del Río, trail from Buenaventura to San Juan de Guacamalla, on tree along small stream, *Wilson 9329* (TYPE of *Spathiger Roigii* in Herb. New York Bot. Gard.; ISOTYPE in Herb. Gray); Pinar del Río, river valley, La Sierra de los Organas, near Cayajabos, *Ames*; Santa Clara, Montañas de Trinidad, *Acuña*; Santa Clara, Trinidad Mountains, Hanabanilla Falls, *Britton, Earle & Wilson 4863*.

Cattleyopsis guanensis Acuña in Estac. Exper. Agrón. Bol. Téc. 60 (Cat. Descr. Orquíd. Cub.) (1939) 109 = **Cattleyopsis Lindenii** *(Lindl.) Cogn.*

The reduction of *Cattleyopsis guanensis* is discussed in the first section of this paper.

TWO MEXICAN HABENARIAS

BY

OAKES AMES AND LOUIS O. WILLIAMS

IN the study of Mexican Habenarias the following new species and the new combination were found to be necessary.

Habenaria umbratilis *Ames & Williams sp. nov.*

Herbae terrestres usque ad 4.5 dm. altae. Folia elliptica vel elliptico-lanceolata, quinquenervia. Sepalum dorsale ovato-orbiculare, trinervium, cucullatum. Sepala lateralia lanceolato-triangularia, acuta vel obtusa, trinervia, arcuata. Petala lanceolata, acuta, arcuata uni- (vel bi-) nervia. Labellum trilobatum; lobi laterales recurvati; lobus medius anguste ligulatus. Columna generis.

Erect leafy terrestrial herbs up to about 4.5 dm. tall. Stems slender, strict or flexuose, leafy (especially above the middle). Leaves 8-12 cm. long and 2-3 cm. broad, elliptic to elliptic-lanceolate, acute, with five main nerves. Inflorescence up to about 10 cm. long, crowded; bracts 1-3 cm. long, lanceolate, acuminate, usually shorter than the ovary. Flowers small for the size of the plant. Dorsal sepal about 4 mm. long and 3.5 mm. broad, ovate-orbicular, 3-nerved, cucullate. Lateral sepals 4.5-6 mm. long and 2.5-3 mm. broad, lanceolate-triangular, acute or obtuse, 3-nerved, arcuate. Petals about 3.5-4 mm. long and 1.5-2 mm. broad, lanceolate, acute, arcuate, 1- (2-) nerved, with or without a small tooth at the base. Lip 3-lobed, the lobes slender and the lateral lobes longest; lateral lobes about 10 mm. long and about 1 mm. broad, spreading, recurved; mid-lobe 5-6 mm. long and about 1 mm. broad, narrowly ligulate. Column of the genus.

Mexico: in grass, in shady places in forest, about Tomasopo, State of San Luis Potosi, longitude ca. 99°23′ West, latitude ca. 21°50′ north, at ca. 500 meters altitude, September 3, 1937, *Dino 6957* (Type in Herb. Ames No. 50948).

Habenaria umbratilis seems to have no near allies among the Mexican Habenarias.

Habenaria entomantha *(Llave & Lex.) Lindley* var. **subauriculata** (Robins. & Greenm.) *Ames & Williams comb. nov.*

Habenaria subauriculata Robinson & Greenman in Proc. Am. Acad. 32 (1896) 34—Ames Orch. 4 (1910) 254, t. 77, figs. 3-4.

Habenaria entomantha var. *subauriculata* differs from the species in having the petals entire or merely subauriculate, not deeply bifid.

JAN 16 1942

BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, JANUARY 16, 1942 VOL. 10, NO. 4

SOME NEW OR NOTEWORTHY GUATEMALAN ORCHIDS

BY

OAKES AMES AND DONOVAN S. CORRELL

IN THE COURSE of our recent studies of Guatemalan orchids, twelve new species and one variety have been recognized. This paper includes descriptions of these novelties and presents also a number of new combinations which were found to be necessary.

Cranichis hieroglyphica *Ames & Correll sp. nov.*

Herba terrestris, unica, erecta vel basi geniculata. Caulis gracilis, pubescens, bracteatus. Folia duo, basalia, subopposita, patentia, vaginis pluribus scariosis amplectentibus prope basim inclusa; lamina oblique elliptica vel ovato-elliptica, acuta vel abrupte acuminata, succulenta, glabra. Racemus densus, cylindraceus. Flores parvi, succedanei. Florum bracteae albidae, lanceolatae, acuminatae. Sepala ovato-elliptica, anguste obtusa vel subacuminata, uni- vel binervia, concava. Petala lineari-lanceolata vel anguste elliptica, obtusa, leviter obliqua, uninervia, marginibus longis cum pilis albidis ciliatis, per medium prope basim minute hirsuta. Labellum sessile, subquadrato-ovatum, anguste obtusum, basi utrinque angulatum; discus lineis leviter incrassatis viridibus, linea media brevi cum linea horizontali medium versus utrinque vergenti et cum linea U-formi prope basim utrinque ornatus. Columna generis.

Plant terrestrial, solitary, erect or geniculate at the base, 2.5–4.5 dm. tall. Stem slender, pubescent with whitish articulated hairs, provided with several short tubular acuminate bracts, 2–3 mm. in diameter. Leaves two, basal and subopposite, spreading on the ground, enclosed at base by two or more scarious clasping sheaths; petiole winged, 2–4.5 cm. long; lamina oblique, elliptic to ovate-elliptic, acute to abruptly acuminate, 4.5–11.5 cm. long, 2.7–5.5 cm. wide, succulent, glabrous, silvery green and glossy beneath, dark-veined above with a reticulate pattern over a dull silvery green background. Inflorescence a compact terminal raceme of twenty to thirty small white flowers which blossom in close succession; raceme cylindrical, 2.5–3.5 cm. long, about 2 cm. in diameter. Floral bracts white, lanceolate, acuminate, 5–6 mm. long. Flowers with stout puberulent pedicellate ovaries. Sepals ovate-elliptic, narrowly obtuse to subacuminate, 1- to 2-nerved, concave, 2.5–3.1 mm. long, 1.3–1.5 mm. wide; lateral sepals slightly oblique. Petals somewhat oblique, linear-lanceolate to narrowly elliptic, obtuse, 1-nerved, ciliate with long whitish hairs, finely hirsute through the center near the base, 2–2.5 mm. long, about 0.7 mm. wide. Lip sessile, subquadrate-ovate, narrowly obtuse, angled on each side at the base, concave, 2–2.5 mm. long, 1.3–1.5 mm. wide; disc adorned with somewhat thickened green stripes, with a short central stripe, a subhorizontal stripe on each side which converge toward the middle and a deeply U-shaped stripe on each side near the base. Column short, terete, about 1.5 mm. long.

Cranichis hieroglyphica is most closely related to *C. Wageneri* Reichb.f. However, besides having smaller flowers, the floral segments of *C. hieroglyphica* are comparatively blunt as compared with the narrowly acuminate floral segments of *C. Wageneri*. Although the petals

of both species are ciliate, those of *C. hieroglyphica* are obtuse while those of *C. Wageneri* are long-acuminate. The shape of the lip and the pattern of the venation are different in the two species. The lip of *C. Wageneri* is narrowly ovate to subcordate and acuminate and the stripe design is composed of three parallel green or brownish stripes with the lateral ones producing retrorse secondary stripes. The lip of *C. hieroglyphica*, on the other hand, is subquadrate-ovate and obtuse and the stripe design, from which the name is derived, is a peculiar pattern. The design of green stripes is composed of a short central stripe with an additional subhorizontal one on each side which converges toward the middle and has a deeply U-shaped stripe on each side near the base. The stripes are somewhat thickened.

GUATEMALA: Chiquimula, upper slopes of Montaña Tajurán, in the vicinity of El Barriol, alt. 1200-1700 m., terrestrial in cloud forest, Oct. 28, 1939, *J. A. Steyermark 30816* (Herb. Field Mus.). Guatemala, Volcán de Pacaya, above Las Calderas, alt. 1800-2400 m., damp forest, Nov. 30, 1938, *P. C. Standley 58432* (Herb. Field Mus.); terrestrial, near San Rafael, road to Antigua, about 6000 ft. alt., Sept. 8, 1935, *Margaret Ward Lewis 154* (TYPE in Herb. Ames No. 60792).

Spiranthes stolonifera *Ames & Correll sp. nov.*

Herba terrestris, aphylla ut videtur, gracilis, rigide erecta, ex radice tuberiformi unica exoriens, stolonifera, basi leviter geniculata, supra canescens. Caulis vaginis adpressis tubulatis subobtusis vel acutis ornatus. Inflorescentia biflora. Florum bracteae magnae, lanceolatae, acuminatae. Flores pro genere grandes. Ovaria cum pedicello fusco-puberula. Sepala extus et margine dense tuberculoso-puberula. Sepalum dorsale elliptico-lanceolatum, obtusum vel breviter subacuminatum, quinquenervium, supra recurvum. Sepala lateralia libera, patentia, lanceolata, acuta vel subobtusa, leviter obliqua, trinervia, leviter carinata. Petala conspicue falcata, oblanceolata,

obtusa. Labellum in positu naturali arcuato-decurvatum, extensum oblongo-oblanceolatum, supra medium constrictum; pars inferior sulcata, basi concavo-saccata et cum callo mammillato submarginali utrinque praedita, extus puberula; pars anterior plana et patens, late ovata vel elliptico-subquadrata, apice late rotundata vel leviter retusa; discus callo sulcato miniato vel aurantiaco infra ornatus. Columna generis.

Plant terrestrial, 25–35 cm. tall, aphyllous at the time of flowering, slender, rigidly erect, arising from a solitary tuberoid, stoloniferous, slightly geniculate at the base, glabrous below, the upper part covered with a hoary puberulence; stolons producing at intervals solitary small ovoid tuberoids which are as much as 2 cm. long. Stem provided with appressed green tubular sheaths which are rather abruptly subobtuse to acute. Inflorescence 2-flowered. Flowers white marked with orange or vermilion, subtended by large bracts; pedicellate ovaries covered with a reddish brown glandular puberulence. Floral bracts green, lanceolate, acuminate, about 3.5 cm. long, with involute margins. Sepals densely tuberculose-puberulent on the margins and outer surface; dorsal sepal strongly recurved above the middle, concave below, elliptic-lanceolate, obtuse to shortly subacuminate, prominently 5-nerved, 1.9–2 cm. long, 4.5–6.5 mm. wide; lateral sepals free, divergent, directed downward, lightly carinate along the central nerve, lanceolate, subobtuse to acute, slightly oblique, prominently 3-nerved, 1.7–2 cm. long, 3.1–3.5 mm. wide. Petals conspicuously falcate, oblanceolate, obtuse, gradually tapering below the middle, 1.8–2 cm. long, 3–3.2 mm. wide above the middle. Lip arcuate-decurved in natural position, oblong-oblanceolate, constricted above the middle, 1.8–2.2 cm. long; lower portion (below the constriction) thick, sulcate, minutely pubescent and concave-saccate at the base, provided with sub-

marginal obscure fleshy mammillate callosities on each side at the base, with the margins upturned and slightly undulate, puberulent on the margins and outer surface; apical portion (above the constriction) flat and spreading, broadly ovate to elliptic-subquadrate, broadly rounded to subtruncate or lightly retuse at the apex, with the margin somewhat undulate-crenulate; disc with a sulcate cinnabar or deep orange callus on the lower portion. Column clavellate, about 1.2 cm. long, toothed at the apex.

This species is closely allied to *Spiranthes hyemalis* A. Rich. & Gal., but differs from that species in several characters. *Spiranthes stolonifera* is a rigidly erect, aphyllous plant which develops tuber-bearing stolons. The stem-sheaths are closely appressed and are always abruptly subobtuse to acute. The sepals and petals are always obtuse to acute. Plants of *S. hyemalis* rise from a cluster of fusiform-thickened roots and the stem, which is commonly flexuose, is leafy below and provided above with rather loose sheaths which are acuminate and divergent at the apex. The sepals and petals are ordinarily long-acuminate.

GUATEMALA: Huehuetenango, Sierra Cuchumatanes, rocky ridge, beneath pines, alt. 11,200 ft., Sept. 15, 1934, *A. F. Skutch 1254* (Herb. Ames); Sierra Cuchumatanes (north slope), terrestrial in mossy ground, open woods, fls. white, the portion of the labellum which forms the corolla-tube orange, alt. 10,000 ft., Aug. 23, 1934, *A. F. Skutch 1094* (TYPE in Herb. Ames No. 60791).

Spiranthes prasophylla *Reichb.f.* var. **cleistogama** *Ames & Correll var. nov.*

Scapo longiore folia multo excedenti et spica conspicue secunda et floribus inapertis a specie differt.

Plant slender, epiphytic, weakly erect, glabrous below, pubescent above, 10–30 cm. tall. Scape slender, two to three times longer than the leaves, provided with several acuminate bracts. Leaves basal, several, clustered, mostly subsessile, occasionally shortly petiolate; lamina elliptic-

lanceolate, acute, up to 8 cm. long and 2.5 cm. wide. Spike usually conspicuously secund, up to 13 cm. long. Flowers cleistogamous, smaller than those of the typical form. Lip pandurate, strongly triangular-deltoid as in the typical form, constricted near the apex to form a triangular-quadrate tridentate lobule; callosities thin, triangular, inside the basal margin.

Variety *cleistogama* differs from the typical form of the species mainly in its much longer scape which greatly exceeds the leaves, its conspicuously secund spike, and its cleistogamous flowers.

GUATEMALA: Alta Verapaz, near Cobán, epiphytic, alt. 1350 m., March 1907 and Feb. 1908, *H. von Tuerckheim II 1673* (TYPE in Herb. Ames No. 1824; ISOTYPE in U.S. Nat. Herb. No. 825824).

COSTA RICA: Cartago, El Muñeco, south of Navarro, on tree, flowers green, alt. about 1400 m., Feb. 8, 9, 1924, *P. C. Standley 33802* (Herb. Ames).

Spiranthes Funckiana *A. Rich. & Gal.* var. **olivacea** (*Rolfe*) *Ames & Correll comb. nov.*

Pelexia olivacea Rolfe in Kew Bull. (1891) 200.
Pelexia hondurensis Ames in Sched. Orch. 2 (1923) 4.
Pelexia subaequalis Ames in Sched. Orch. 2 (1923) 5.

Variety *olivacea* may be distinguished from typical *S. Funckiana* through its narrower sepals and petals which are acute to acuminate instead of being obtuse. The base of the lip of var. *olivacea* has thickened, mammillate, semiterete calli, whereas the lip of *S. Funckiana* has oblong, flat, apiculate auricles. The general aspect of the two concepts is very similar. However, the petiole is longer and the lamina of the leaf is much larger in var. *olivacea* than in the typical form of the species. The position and appearance of the lateral sepals is most helpful in separating these two entities in the field. The lateral sepals of var. *olivacea* are not conspicuously arcuate-decurved and directed back toward the rachis as in *S.*

Funckiana but are more slender and gently curved and directed downward and outward.

Uncommon in Mexico, Guatemala, Honduras and South America.

Spiranthes Llaveana *Lindl.* var. **violacea** (*A. Rich. & Gal.*) *Ames & Correll comb. nov.*

Spiranthes violacea A. Richard & Galeotti in Ann. Sci. Nat. ser. 3, 3 (1845) 32.

Variety *violacea* differs from the typical form of the species mainly in that the flowers are mostly smaller, and the lip is pandurate instead of being oblong with obscure lateral constrictions. The apical lobule of the lip is orbicular with undulate-crenulate margins and is usually wider than the basal portion. The basal half below the constriction is obovate to oblong-obovate with the lateral margins rounded toward the constriction. The lip of *S. Llaveana* is usually widest below the slight constriction and the basal half is oblong-quadrate to broadly cuneate with the lateral margins terminated by more or less obtuse angles just below the constriction. The lip of var. *violacea* is white tinged with pink or lavender with the lateral lobules often greenish yellow. The sepals and petals are pink.

Uncommon in Mexico and Guatemala.

Spiranthes picta (*Anders.*) *Lindl.* var. **assurgens** (*Reichb.f.*) *Ames & Correll comb. nov.*

Spiranthes assurgens Reichenbach filius in Beitr. Orch. Centr.-Am. (1866) 66.

The most distinctive difference separating var. *assurgens* from the typical form is the shape of the lip which is broad at the base and gradually narrowed above to the apical lobe. The lower part of the lip below the constriction is lanceolate instead of oblanceolate as in the typical form of this species. The apical lobe of the lip of var.

assurgens is also sagittiform, whereas that of *S. picta* is cordate or broadly ovate.

Found only in Guatemala.

The following two species of *Spiranthes* are of interest because they are new to Central America.

Spiranthes tortilis (*Sw.*) *L. C. Richard* in Mém. Mus. Hist. Nat. Paris 4 (1818) 59, exclude synon. *Neottia quadridentata.*

Formerly known from Florida to Louisiana, Bermuda, Bahama Islands, the West Indies and Trinidad. Now also known from British Honduras (*Peck 967*), Guatemala (*Steyermark 38660*) and Nicaragua (*Englesing 303*).

Spiranthes vernalis *Engelmann & Gray* in Boston Journ. Nat. Hist. 5 (1845) 236.

Formerly known from Canada (Quebec) and New England south to Florida and west to Indiana, Illinois, Texas and New Mexico. Now also known from Mexico (*Pringle 11914, in part*) and Guatemala (*Tuerckheim II 1832; Skutch 362*).

Goodyera major *Ames & Correll sp. nov.*

Herba terrestris, pro genere grandis, a rhizomate repenti erecto-adscendens. Caulis infra foliosus et glaber, supra bracteatus et glanduloso-pubescens. Folia petiolata; lamina oblique elliptico-lanceolata, acuminata; petiolus tubulari-inflatus. Racemus cylindraceus, spicatus, subdensus, rhachide glanduloso-pubescenti. Florum bracteae ovato-lanceolatae, acuminatae, glanduloso-pubescentes. Flores parvi, ringentes, cum ovariis pedicellatis crassis glanduloso-pubescentibus. Sepalum dorsale lanceolatum, ad apicem obtusum angustatum, canaliculatum, uninervium. Sepala lateralia oblique ovato-lanceolata, obtusa, uninervia, infra concava. Petala sepalo dorsali adhaerentia, ab ungui gracili semirhombica, obtusa, uninervia,

margine exteriore erosa. Labellum sessile; lamina in positu naturali arcuata, basi saccato-globosa et papillis intus praedita, trinervia, cum marginibus superioribus erosis; lamina expansa late oblongo-pandurata, supra medium constricta, tandem in apicem rotundatum vel retusum minute plicatum dilatata. Columna generis.

Plant terrestrial, with a prostrate rhizome, erect-ascending, large for the genus, 5–7 dm. tall. Stem leafy and glabrous on the lower half, bracteate and glandular-pubescent above; bracts acuminate, 1.5–3.5 cm. long. Leaves five to eight, rather large, with conspicuous inflated clasping petioles; petioles tubular at the base, up to 4 cm. long; lamina obliquely elliptic-lanceolate, acuminate, submembranaceous, 7.5–11.5 cm. long, 2–3.5 cm. wide. Inflorescence a cylindrical spicate raceme, rather densely flowered, 6.5–7 cm. long, 2.5 cm. in diameter; rachis glandular-pubescent. Floral bracts ovate-lanceolate, acuminate, glandular-pubescent, 9–12 mm. long, about 3.5 mm. wide near the base. Flowers ringent, with stout glandular-pubescent pedicellate ovaries which are about 1 cm. long. Dorsal sepal lanceolate, tapering to an obtuse apex, 1-nerved, canaliculate, 6–6.5 mm. long, about 2 mm. wide. Lateral sepals somewhat oblique, ovate-lanceolate, obtuse, 1-nerved, concave below, 6.5 mm. long, 3.2 mm. wide below the middle. Petals with a slender claw, adherent to the dorsal sepal, semi-rhombic, obtuse, 1-nerved, erose on the outer margin, slightly denticulate on the inner margin above the middle, 6 mm. long, 2.5 mm. wide at about the middle. Lip sessile, arcuate in natural position, with a globose-saccate base (the sac about 2.5 mm. deep and provided with papillae on the inner surface), 3-nerved, erose on the margins above the middle; when spread out broadly oblong-pandurate with a suborbicular-ovate base, 6 mm. long, 4.5 mm. wide across the base, 2.5–3 mm. wide across

the apical portion, constricted above the middle and dilated at the broadly rounded to truncate or retuse apex, with the apical portion minutely plicate. Column stout, terete, about 4 mm. long.

Goodyera major is the largest known Central American species in this genus. The lip is nearest in shape to that of *G. modesta* Schltr., a Costa Rican species. However, besides having much smaller flowers than *G. major*, *G. modesta* has an entire lip and linear petals. The nearest ally, *G. dolabripetala* (Ames) Schltr., not only has a laxly flowered raceme of much smaller flowers, but has an ovate-lanceolate lip with entire margins.

GUATEMALA: Zacapa, cloud forest in ravine bordering Quebrada Alejandria, summit of Sierra de las Minas, vicinity of Finca Alejandria, alt. 2500 m., Oct. 13, 1939, *J. A. Steyermark 29886* (TYPE in Herb. Ames No. 60790; ISOTYPE in Herb. Field Mus. No. 1043013).

Erythrodes ovatilabia *Ames & Correll sp. nov.*

Herba terrestris, ex rhizomate repenti erecto-adscendens. Caulis gracilis, pubescens, infra foliosus, supra bracteatus. Folia petiolata; lamina oblique ovato-elliptica vel ovalis, acuta vel subacuminata, basi rotundata vel sensim angustata; petiolus tubulari-inflatus. Racemus densior, cylindraceus, spicatus, rachide pubescenti. Florum bracteae ovato-lanceolatae, acuminatae. Flores parvi, cum ovariis pedicellatis pubescentibus. Sepala lanceolata vel anguste elliptico-lanceolata, acuminata vel ad apicem subobtusum sensim angustata, uninervia. Petala sepalo dorsali adhaerentia, semirhombica, obtusa vel subacuta, basi anguste cuneata, uninervia. Labellum basi in calcar saccatum leviter bilobatum productum; lamina tenuis, extensa ovata, obtusa vel acuta, trinervia, saepissime marginibus leviter undulatis. Columna generis.

Plant terrestrial, erect-ascending from a prostrate rhizome, 3–4 dm. tall. Stem slender, pubescent with whitish articulated hairs, leafy on the lower fourth, bracteate

above; bracts acuminate, spreading, up to 3.5 cm. long. Leaves five to eight, petiolate; petiole tubular-inflated below enveloping the stem, up to 3 cm. long; lamina oblique, ovate-elliptic to broadly elliptic, acute to subacuminate, rounded or tapering at the base, dark green above with a whitish mid-nerve, gray-green beneath, 3–8.5 cm. long, 1.4–3 cm. wide. Inflorescence a rather densely flowered cylindrical spicate raceme, up to 7 cm. long and 2 cm. in diameter; rachis pubescent. Floral bracts ovate-lanceolate, acuminate, 4–7 mm. long, about 2 mm. wide near the base. Flowers small, with pubescent pedicellate ovaries which are up to 6 mm. long. Sepals lanceolate to narrowly elliptic-lanceolate, acuminate or tapering to a narrowly subobtuse apex, 1-nerved, 4.8–5 mm. long, about 1.5 mm. wide below the middle. Petals adherent to the dorsal sepal, semirhombic, narrowly cuneate at the base, obtuse to subacute, 1-nerved, about 4.5 mm. long and 1.5 mm. wide across the dilated middle portion. Lip produced at the base into a slightly bilobed saccate spur, about 7 mm. long including the spur; lamina thin, when spread out ovate (sometimes narrowly so), obtuse to acute, usually with the margins slightly undulate, 3-nerved, 4 mm. long, 2.5 mm. wide at the base. Column short, thick, about 2.5 mm. long.

Erythrodes ovatilabia is one of the few American species in the genus having a simple lip. Its nearest ally, *E. secunda* Ames from Mexico, is a much smaller plant with small ovate-subcordate leaves and a laxly few-flowered secund inflorescence. The essentially oval lip of *E. secunda* has a thickened disc and a somewhat constricted crisped apex. The petals also are spatulate instead of being semirhombic as in *E. ovatilabia*.

MEXICO: Oaxaca, Huautla de Jiménez, terrestrial, oak forest, July 21, 1938, *R. E. Schultes and B. P. Reko 407* (Herb. Ames).

GUATEMALA: Chiquimula, upper slopes of Montaña Jajurán, in the

vicinity of El Barriol, alt. 1200-1700 m., Oct. 28, 1939, *J. A. Steyermark 30826* (Herb. Ames, Herb. Field Mus.); Jalapa, Volcán Jumay, north of Jalapa, alt. 1300-2200 m., Dec. 1, 1939, *J. A. Steyermark 32471* (TYPE in Herb. Field Mus. No. 1043068).

Lepanthes excedens *Ames & Correll sp. nov.*

Herba minuta, caespitosa, epiphytica, erecta vel adscendens. Caulis filiformis, monophyllus, vaginis pluribus infundibuliformibus obtectus. Vaginae caulinae cylindraceae, leviter costatae, supra dilatatae, costis et margine apicali ciliolatis. Folia elliptica vel oblanceolata, obtusa vel subacuta cum apice tridenticulato, in petiolum brevem angustata, carnosa, glabra. Inflorescentiae unicae vel binae, quam folium paulo breviores, laxiflorae. Florum bracteae ovato-cucullatae, acutae, ovario pedicellato longiores. Flores perparvi, leviter arcuato-decurvati. Sepala basi connata. Sepalum dorsale elliptico-lanceolatum, acutum, infra medium concavum, trinervium. Sepala lateralia paene usque ad medium connata, oblique ovato-elliptica, acuta. Petala oblique et late flabelliformi-biloba-ta, in sinu apiculata; lobus posterior oblongo-lanceolatus, obtusus; lobus anterior oblique quadratus, truncatus vel retusus. Labellum ab ungui lato in circuitu obovatum, trilobatum: lobi laterales valde incurvi, lineari-oblanceolati, crescentiformes, apice rotundati, alter alterum excedens; lobus medius parvus, ovato-triangularis, subacutus, valde pubescens. Columna cylindracea, dorso cum lacinia subapicali; clinandrium tridentatum.

Plant minute, erect or ascending, caespitose, epiphytic, usually less than 4 cm. tall. Roots simple, white, filiform. Secondary stem filiform, red, monophyllous, less than 1.5 cm. long, concealed by two or more infundibuliform sheaths. Sheaths dilated and acute at the apex, lightly costate, with the costae and apical margin ciliolate. Leaves dark green or ruddy especially on the lower surface and near the margins, elliptic to oblanceolate, obtuse

to subacute and tridenticulate at the apex, tapering at the base into the short petiole, marginate, fleshy, glabrous, somewhat undulate-contracted on the margins and conduplicate-ensiform with age, up to 13 mm. long including the petiole and 5.5 mm. wide. Inflorescences one or two, commonly a little shorter than the leaf, loosely 3- to 8-flowered. Floral bracts ovate-cucullate, acute, glabrous, less than 1 mm. long, longer than the pedicellate ovaries. Flowers extremely small, somewhat arcuate-recurved, about 3 mm. long. Sepals pale yellowish green, united at the base. Dorsal sepal elliptic-lanceolate, acute, concave below the middle, 3-nerved, up to 3 mm. long and 1.5 mm. wide near the base. Lateral sepals united to about the middle, obliquely ovate-elliptic, acute, up to 2.5 mm. long and 1 mm. wide above the point of coalescence. Petals green and reddish purple, broadly flabelliform-bilobed, with an apicule in the sinus, up to 0.5 mm. long and 1.2 mm. wide; posterior lobe oblong-lanceolate, obtuse; anterior lobe obliquely quadrate, truncate or retuse at the apex. Lip bright purple, with a rather broad involute claw, 3-lobed, obovate in outline, about 1 mm. long, usually narrower than long; lateral lobes not auriculate at the base, linear-oblanceolate, crescentiform, broadly rounded at the apex, incurved so as to overlap one another, lightly keeled near the middle; mid-lobe small, narrowly ovate-triangular, subacute, pubescent. Column cylindrical, fleshy, about 1.2 mm. long, with a dorsal flap near the apex, acute-apiculate at the apex; clinandrium tridentate; pollinia two.

This species is easily identified by its peculiar lip which has rather broad lateral lobes which are incurved in front so as to overlap. The column and petals are also distinctive and are useful in separating the species from nearly allied entities. The specific name signifies "overlapping" in reference to the position of the lateral lobes of the lip.

GUATEMALA: Road to Mataquescuintla, about 18 miles from Guatemala City, alt. about 6000 ft., February 19, 1935, *Margaret Ward Lewis 105* (TYPE in Herb. Ames No. 58148).

Pleurothallis angustisepala *Ames & Correll sp. nov.*

Herba crassa, epiphytica, erecta vel adscendens, glabra, caespitosa. Caulis rigidus, monophyllus, vaginis pluribus scariosis inflatis ornatus. Folium oblongo-ellipticum vel lanceolatum, breviter acuminatum cum apice minute tridenticulato, sessile, coriaceum. Racemi unici vel plures, subsessiles, dense pauciflori, rigidi, basi vagina conduplicata acuminata inclusi. Florum bracteae infundibuliformes, acuto-apiculatae, scariosae. Flores majores, cum pedicellis brevibus bracteis aequilongis. Sepala omnino granosa. Sepalum dorsale anguste lineare, longe acuminatum, trinervium. Sepala lateralia in laminam elliptico-lanceolatam fere usque ad apicem connata; lamina acute bifida, basi conspicue gibbosa, sexnervia, nervo medio utriusque dorso carinato. Petala lineari-oblanceolata, acuta vel breviter acuminata, uninervia, marginibus supra medium irregulariter longe serratis. Labellum basi valde arcuatum, prominenter unguiculatum; unguis subquadratus, incrassatus, dente minuto utrinque basi donatus; lamina triangulari-lanceolata, breviter acuminata, basi auricula denticulata prominenti utrinque praedita; discus trinervius, crasse papillosus. Columna generis.

Plant coarse, epiphytic, erect or ascending, glabrous, caespitose, 11–25 cm. tall. Secondary stem rigid, monophyllous, 2.5–11 cm. long, provided with several scarious somewhat inflated sheaths. Leaf sessile, oblong-elliptic to lanceolate, shortly acuminate and minutely tridenticulate at the apex, coriaceous, dark purple on the lower surface, 6–13 cm. long, 1.5–3.5 cm. wide. Racemes one to several, essentially sessile, rigid, densely few-flowered, up to 4.3 cm. long, enclosed at the base by a scarious

conduplicate sheath; sheath acuminate, up to 1.5 cm. long. Floral bracts infundibuliform, acute-apiculate, scarious, 3–4.5 mm. long. Flowers rather large, yellow or greenish yellow, with short pedicels; pedicels about as long as the bracts. Sepals granulose on the inner and outer surfaces and along the margins. Dorsal sepal narrowly linear, long-acuminate, 3-nerved, sulcate below the middle, 16–17 mm. long, 1.5–2 mm. wide. Lateral sepals united almost to the apex to form an elliptic-lanceolate lamina; lamina sharply bifid, conspicuously gibbous at the base, 6-nerved, dorsally carinate along the mid-nerve of each sepal especially below the middle, 16–18 mm. long, 6.5–7.2 mm. wide at or near the middle. Petals linear-oblanceolate, acute to shortly acuminate, with the margins irregularly long-serrate above the middle, 1-nerved, 3.5–4.5 mm. long, about 1 mm. wide. Lip strongly arcuate at the base, with a prominent claw; lamina triangular-lanceolate, shortly acuminate, with a prominent denticulate auricle on each side at the base, irregularly fimbriate along the margins, 6–6.3 mm. long, 2.5–3 mm. wide at the base; disc 3-nerved, coarsely papillose; claw fleshy-thickened, subquadrate, with a minute tooth on each side at the base, 1.5–2 mm. long, 1.2–1.5 mm. wide. Column rather stout, broad, irregularly crenate at the apex, 3–4 mm. long, with a foot 3–4 mm. long. Capsule obliquely ellipsoid, about 2 cm. long.

Pleurothallis angustisepala is easily distinguished from *P. Rowleei* Ames, a close ally, by its narrowly linear dorsal sepal and by its differently shaped fimbriate and auriculate lip.

GUATEMALA: Alta Verapaz, above Tamahú, on tree, alt. 900-1200 m., April 5, 1939, *P. C. Standley 70958* (TYPE in Herb. Field Mus. No. 995124); same data, *P. C. Standley 70895* (Herb. Field Mus.); growing on the under side of limbs, on a small shrub at about two to three feet from the ground Nov. 28, 1920, *H. Johnson 1169* (Herb. Ames).

Pleurothallis crucilabia *Ames & Correll sp. nov.*

Herba parva, epiphytica, erecta vel adscendens, caespitosa. Caulis gracilis, unifoliatus, vaginis lepanthiformibus omnino obtectus. Vaginae caulinae tubulares, costibus parce hispidis donatae, supra in apicem acuminato-apiculatum hispidum leviter dilatatae. Folium linearioblongum, acutum, coriaceum, marginatum, glabrum. Pedunculi saepissime duo, graciles; racemi laxe pauciflori. Florum bracteae infundibuliformes, acuto-apiculatae, scariosae. Flores glabri, valde arcuati, pedicellis gracilibus conspicue arcuatis. Sepalum dorsale elliptico-oblongum, acutum, valde cymbiforme, nervis dorso carinatis. Sepala lateralia usque ad medium connata, basi gibbosa, oblique triangulari-lanceolata, acuminata, decurvata, dorso carinata. Petala oblique oblonga, apice late rotundata, uninervia. Labellum breviter unguiculatum, in positu naturali arcuatum, expansum trilobatum, trinervium; lobi laterales late rotundati, marginibus apicalibus leviter incrassatis; lobus medius oblongo-quadratus, apice subtruncatus. Columna generis.

Plant small, epiphytic, erect or ascending, caespitose, up to 7.5 cm. tall. Secondary stem slender, monophyllous, 2–3.5 cm. long, concealed by lepanthiform sheaths; sheaths tubular, acuminate-apiculate at the slightly dilated apex, sparingly hispid along the costae and on the apical margin. Leaf linear-oblong, acute, coriaceous, marginate, glabrous, 1.5–2.5 cm. long, about 5 mm. wide. Peduncles usually two, slender, up to 4 cm. long including the loosely few-flowered raceme. Floral bracts infundibuliform, acute-apiculate, scarious, 1.5–2 mm. long. Flowers pale yellow, glabrous, strongly arcuate, with slender persistent conspicuously arcuate pedicels which are about 3 mm. long. Dorsal sepal elliptic-oblong, acute, deeply cymbiform, 3-nerved, dorsally carinate along the nerves, 4.5–5.3 mm. long, 2.5–3 mm. wide below the mid-

dle. Lateral sepals united to about the middle, gibbous at the base, obliquely triangular-lanceolate, acuminate, decurved, dorsally prominently carinate along the solitary nerve, 4–5 mm. long, 2–2.5 mm. wide across the united basal portion. Petals obliquely oblong, broadly rounded at the apex, 1-nerved, 2–2.5 mm. long, 0.8–1 mm. wide. Lip with a short claw, arcuate in natural position, hastately 3-lobed when spread out, 3-nerved with the nerves extending slightly above the middle of the lip, 3–3.2 mm. long including the claw, 1.8–2.2 mm. wide across the lateral lobes; lateral lobes broadly rounded, slightly thickened on the apical margins; mid-lobe oblong-quadrate, subtruncate at the apex, about 1 mm. wide. Column short, stout, fleshy, tridentate at the apex, 2 mm. long, with a foot about 1 mm. long. Capsule obliquely globose, about 4 mm. long.

This species is unique among the Guatemalan species of *Pleurothallis* in that it has a subequally three-lobed lip. There seems to be no closely allied species in Central America. The Jamaican *Pleurothallis trilobata* Fawc. & Rendle has a similarly shaped lip. However, that species is a minute plant less than 1 cm. tall and the lip is only about one half as long as that of *P. crucilabia*.

GUATEMALA: Guatemala, Volcán de Pacaya, above Las Calderas, alt. 1800-2400 m., Nov. 30, 1938, *P.C.Standley 58433* (TYPE in Herb. Field Mus. No. 974102).

Pleurothallis triangulipetala *Ames & Correll sp. nov.*

Herba parva, epiphytica, caespitosa, erecta. Caulis gracilis, unifoliatus, vaginis lepanthiformibus obtectus: vaginae tubulatae, costis prominentibus hispidis, in apicem acuto-apiculatum hispido-ciliatum dilatatae. Folium a petiolo brevi sulcato suborbiculare vel late ellipticum, obtusum vel retusum et cuspidatum, marginatum, glabrum, coriaceum. Pedunculi plures, filiformes, glabri, cum

racemo paucifloro. Florum bracteae ovato-cucullatae, subacutae, scariosae. Flores parvi, cum ovariis pedicellatis gracilibus bracteis subaequalibus. Sepalum dorsale triangulari-ovatum, obtusum, supra parce ciliatum. Sepala lateralia fere usque ad apicem connata, laminam late ellipticam formantia: lamina obtuse bifida, dorso bicarinata, supra parce ciliata. Petala oblique triangularia, breviter acuminata, uninervia. Labellum in positu natural arcuato-decurvatum, expansum lineari-oblongum, obtusum, infra medium leviter dilatatum, marginibus inferioribus leviter incurvatis et marginibus superioribus revolutis, basi utrinque cum auricula parva incurvata; lamina obscure trinervia, tertia inferiore callo lineari supra bifurcato ornata. Columna generis.

Plant small, epiphytic, erect, caespitose, up to 8 cm. tall. Secondary stem slender, monophyllous, 1.8–5 cm. long, concealed by three to six lepanthiform sheaths; sheaths tubular, acute-apiculate at the dilated apex, hispid along the prominent costae and apical margin. Leaf with a short sulcate petiole, suborbicular to broadly elliptic, obtuse and retuse at the apex with a cusp in the sinus, marginate, glabrous, coriaceous, 2–3 cm. long, 1–1.5 cm. wide. Peduncles several, filiform, glabrous, about 1.5 cm. long including the few-flowered raceme. Floral bracts ovate-cucullate, subacute, scarious, tinged with purple, about 2 mm. long. Flowers small, purplish white, with slender pedicels which are about as long as the bracts. Dorsal sepal triangular-ovate, obtuse, 3-nerved, sparingly ciliate on the apical margins, 4 mm. long, 2.2 mm. wide at the base. Lateral sepals united almost to the apex to form a broadly elliptic lamina; lamina obtusely bifid, 4 mm. long, 2.5 mm. wide, 6-nerved, dorsally carinate along the mid-nerve of each sepal, sparingly ciliate on the apical margins. Petals obliquely triangular, shortly acuminate, entire, 1-nerved,

1.5 mm. long, about 0.7 mm. wide at the base. Lip arcuate-decurved in natural position, linear-oblong when spread out, obtuse, slightly dilated below the middle with the margins somewhat upturned, apical margins deflexed, silky-pubescent along the margins, with a small incurved auricle on each side at the base, 2.5 mm. long, about 1 mm. wide; disc obscurely 3-nerved, provided in the middle of the lower third with a linear callus which divides and extends above the middle of the lip as two slightly thickened ridges. Column short, stout, fleshy, irregularly serrate at the apex, 1.5 mm. long, with a broad foot about 1 mm. long. Capsule subglobose, about 5 mm. long.

This species is closely allied to *P. Blaisdellii* S. Wats. and *P. gnomonifera* Ames, but differs mainly in its entire triangular petals and essentially glabrous sepals.

GUATEMALA: Sacatepéquez, Barranco Hondo, lower slopes of Volcán de Fuego, alt. about 1800 m., Dec. 16, 1938, *P. C. Standley 60278* (TYPE in Herb. Field Mus. No. 993854).

Liparis vexillifera (*La Llave & Lex.*) *Cogn.* var. **Galeottiana** (*A. Rich. & Gal.*) *Ames & Correll comb. nov.*

Malaxis Galeottiana A. Richard & Galeotti in Ann. Sci. Nat. ser. 3, 3 (1845) 18.

Liparis Galeottiana Hemsley in Gard. Chron. n.s. 11 (1879) 559.

Variety *Galeottiana* is distinguished from the typical form of the species mainly in the size of the flowers, in the shape and coloration of the lip and in the size of the leaf. The lip of var. *Galeottiana* is brownish purple to almost maroon, not constricted above the middle, broadly ovate-oval to oval-subquadrate, subtruncate to obtuse at the apex, often with conspicuous auricles at the base and is usually about 10 mm. long and 8 mm. wide. The lip of *L. vexillifera* is greenish marked with purple, with a definite constriction above the middle, orbicular-ovate to

ovate-oblong, obtuse to acute at the apex and is commonly 7 mm. long and 5.5 mm. wide. Although plants intermediate between var. *Galeottiana* and *L. vexillifera* are occasionally found, the above characters are rather constant in the two entities.

Variety *Galeottiana* is apparently confined to the mainland of Mexico, Guatemala, Honduras, Venezuela, Bolivia and Argentina.

Nageliella angustifolia (*Booth ex Lindl.*) *Ames & Correll comb. nov.*

Hartwegia purpurea Lindl. var. *angustifolia* Booth ex Lindley in Bot. Reg. 29 (1843) Misc. p. 45.

Vegetatively, *Nageliella angustifolia* and *N. purpurea* (Lindl.) L. O. Wms. are strikingly similar, the only difference being that the leaves of *N. angustifolia* are commonly narrower and thicker than those of *N. purpurea.* However, florally, the two plants are quite distinct and are here considered to be specifically different. The lip of *N. angustifolia* does not have a protruding saccate base as does the lip of *N. purpurea.* The lip is also only slightly adnate to the column instead of being conspicuously adnate as in *N. purpurea*, and the apical portion of the lip is much larger and of a form different from that of *N. purpurea.*

This species is apparently endemic to Guatemala where it is very rare.

Epidendrum alticola *Ames & Correll sp. nov.*

Herba erecto-adscendens, ramosa, magna, epiphytica. Caulis teres, vaginis tubulatis evanidis omnino celatus. Folia duo, caulis primarii et ramorum apice subopposita, oblongo-elliptica, obtusa vel subacuta. Inflorescentia racemosa, inter folia exoriens, pendula. Florum bracteae lineari-lanceolatae, acuminatae. Flores pro genere mediocres, incrassati. Sepalum dorsale oblongo-oblanceolatum,

apice obtuso apiculatum. Sepala lateralia oblique elliptico-ovata, acuta, dorso cum carina conspicua denticulata. Petala oblique spathulato-oblanceolata, acuta. Labellum columnae valde adnatum: lamina suborbiculari-cordata, apice retusa, basi valde cordata, multivenosa, obtuse tricarinata cum carinis lateralibus brevibus et carina media longa supra sensim dilatata. Columna magna, generis.

Plant epiphytic, erect-ascending, branched, large, 45 cm. tall. Stem terete, wiry, about 5 mm. in diameter, concealed by the imbricated scarious leaf-sheaths. Leaves two, at the summit of the main stem and branches, subopposite, oblong-elliptic, obtuse to subacute, articulate with the leaf-sheaths, 8–11.5 cm. long, 2–2.5 cm. wide, each pair of leaves subtended by two scarious sheaths, the upper sheath long-acuminate. Inflorescence a simple raceme at the apex of the main stem and branches, from between the two leaves; raceme recurved-pendent, 12.5 cm. long including the short peduncle, 6 cm. in diameter. Floral bracts linear-lanceolate, acuminate, scarious, up to 2.3 cm. long. Flowers rather large, fleshy-thickened, with slender pedicellate ovaries which are about 2 cm. long. Sepals and petals cream-color or light tan. Dorsal sepal oblong-oblanceolate or occasionally oblong-elliptic, narrowly obtuse-apiculate at the apex, 1.7 cm. long, 6 mm. wide. Lateral sepals oblique, ovate-elliptic or occasionally oblong-elliptic, acute, prominently keeled along the back with the keel excurrent and toothed along the margin, 1.8 cm. long, 6.5 mm. wide. Petals oblique, spatulate-oblanceolate, acute, minutely ciliate, 1.7 cm. long, 5 mm. wide. Lip adnate to the column; lamina suborbicular-cordate, retuse at the apex, strongly cordate at the base, waxy white, 1.5 cm. long, 1.8 cm. wide; disc prominently veined, with three keels in the center, the lateral keels much thickened near the base of the lip and scarcely extending to the middle of the lip, the central

keel extending to the apical sinus and conspicuously broadened and enlarged at the apex. Column clavate, large, 9 mm. long.

This species is allied to *Epidendrum arbuscula* Lindl., *E. comayaguense* Ames and *E. bisulcatum* Ames. It differs from *E. arbuscula* primarily in its simple instead of 3-lobed lip and from *E. bisulcatum* chiefly in the oblanceolate instead of linear petals and the strongly carinate instead of ecarinate lateral sepals. It differs from *E. comayaguense* primarily in the larger many-flowered raceme, strongly carinate lateral sepals and entire, not fimbriate, lip.

GUATEMALA: Chimaltenango, quite abundant at an altitude of 8000 ft. near Calderas on Volcán de Acatenango, May 29, 1939, *J. R. Johnston 1472* (TYPE in Herb. Ames No. 58193).

Epidendrum verrucosum Ste. var. **myrianthum** (*Lindl.*) *Ames & Correll comb. nov.*

Epidendrum myrianthum Lindley Fol. Orch. Epid. (1853) p. 59.

Epidendrum myrianthum Lindl. [var.] *album* "Rchb. f." ex Williams Orch. Grow. Man. ed. 7 (1894) 387.

Variety *myrianthum* is identical in habit with *E. verrucosum* and, except for the color, the flowers are also identical in appearance. Instead of being constantly white as in the typical form of the species, the color of the flowers of var. *myrianthum* varies from almost pure white to a deep ruby-red or purplish red. They also have an odor of lilacs. The character which best separates these two concepts is the callus on the lip. The callus of var. *myrianthum* is 2-lobed at the apex instead of being 3-lobed as in *E. verrucosum*. The callus has the appearance of being composed of two distinct short linear keels. Variety *myrianthum* is closely related to *E. centropetalum* Reichb. f.

Mexico, Guatemala and Honduras; rare.

Scaphyglottis minutiflora *Ames & Correll sp. nov.*

Herba diffusa, saepe ramosa, nodis radicans. Caules fasciculati, teretes, tenuiter fusiformes, nodis constrictis basibus vaginis pluribus tubulatis imbricatis celatis. Folia in nodis bina, linearia vel lineari-lanceolata, apice acuminato oblique bidentata, erecta vel erecto-patentia. Inflorescentiae in nodis glomeratae. Flores minuti, plures vel numerosi, succedanei, subsessiles. Sepala ovato-elliptica, acuta vel subobtusa, trinervia, concava, lateralia leviter obliqua et mentum parvum formantia. Petala lineari-oblonga, leviter obliqua, obtusa, uninervia. Labellum columnae pedi subarticulatum, leviter trilobatum, apice expanso truncatum vel leviter retusum; lobi laterales parvi, rotundati, mediani, in positu naturali erecti: lobus medius expansus quadratus marginibus crenulatis incurvatis. Columna generis.

Plant fasciculate, straggly, frequently branching, with adventitious roots at the nodes, 2.5–7.5 dm. tall. Stem terete, slender-fusiform, constricted at the nodes, the individual internodes enveloped at the base by several scarious tubular imbricated sheaths; lowermost internode up to 26 cm. long and 5 mm. in diameter. Leaves produced in pairs at the nodes, erect to erect-spreading, articulated with the leaf-sheaths, linear to linear-lanceolate, obliquely bidentate at the acuminate apex, firmly membranaceous, 5–18 cm. long, 3–10 mm. wide. Inflorescences glomerate, produced at the nodes, composed of several or numerous almost sessile flowers appearing successively from between dry fibrous bracts which form tufts around the flowers. Flowers minute, with pedicellate ovaries which are 3–4 mm. long, white or greenish white marked with maroon or deep violet. Sepals ovate-elliptic, subobtuse to acute, 3-nerved, concave, 2.2–3 mm. long, 1.2–1.5 mm. wide; lateral sepals slightly oblique and connate below the column-foot to form a small mentum. Petals

slightly oblique, linear-oblong, obtuse, 1-nerved, 2–2.5 mm. long, about 0.7 mm. wide. Lip subarticulate with the column-foot, lightly 3-lobed, 5-nerved, truncate to lightly retuse at the apex when spread out, with two deep violet or maroon blotches on each side near the apex, 3–3.5 mm. long, 1.7–2 mm. wide across the lateral lobes when spread out: lateral lobes small, rounded, arising from about the middle of the lip, erect in natural position; mid-lobe quadrate when spread out, with the crenulate margins upcurved in natural position. Column 2–2.5 mm. long. Capsule obliquely ovoid, 5–6 mm. long.

Scaphyglottis minutiflora is most closely allied to *S. Behrii* (Reichb. f.) Benth. & Hook. f. ex Hemsl. However, it differs from that species not only in its smaller flowers and broader leaves but also in the shape of the lip. The lip of *S. minutiflora* is elliptic in outline with a broad base and the lateral lobes are produced at about the middle of the lip. The lip of *S. Behrii* is spatulate or obovate in outline, is narrowed at the base and the lateral lobes are produced above the middle or near the apex of the lip. The flowers of both species are produced in fascicles at the nodes. However, the flowers and capsules of *S. minutiflora*, which are essentially sessile, are borne in glomerules and are surrounded by tufts of fibrous bracts, whereas the flowers and capsules of *S. Behrii* are distinctly pedicellate and are subtended by solitary bracts.

British Honduras: Stann Creek Valley, Antelope Ridge, on tree, hilltop in "Mountain cabbage" ridge, Jan. 24, 1940, *Percy H. Gentle 3162* (Herb. Ames).

Guatemala: Izabal, La Vigia, between Bananera and Quiriguá, Sept. 15, 1936, *Margaret Ward Lewis 186* (Type in Herb. Ames No. 59153); between Bananera and "La Presa" in Montaña del Mico, alt. 40-300 m., epiphyte on small tree, along stream above waterfall, March 28, 1940, *J. A. Steyermark 38248* (Herb. Ames, Herb. Field Mus.).

Panama: Coclé, hills north of El Valle de Antón, alt. 800-1000 m., epiphytic, sepals and petals greenish white, labellum marked with maroon, Nov. 21, 1940, *P. H. Allen 2258* (Herb. Ames).

Since *Hexadesmia* and *Scaphyglottis* are now considered to be congeneric (Schweinfurth in Bot. Mus. Leafl. Harvard Univ. 10 (1941) 27), the following new combinations are necessary for the following Guatemalan species.

Scaphyglottis confusa (*Schltr.*) *Ames & Correll comb. nov.*

Hexadesmia confusa Schlechter in Fedde Repert. 10 (1912) 361.

Pachystele confusa Schlechter in Fedde Repert. Beih. 19 (1923) 114.

Scaphyglottis confusa is distinguished from *S. livida* (Lindl.) Schltr. and from *S. Jiminezii* Schltr., two closely allied species, not only by its crenulate lip-margin but also by the pedicellate ovaries which are always concealed by the closely imbricated floral bracts. The flower, itself, is often partially concealed by the subtending bracts.

Uncommon in Mexico; rather common in Guatemala and Honduras.

Scaphyglottis crurigera (*Batem. ex Lindl.*) *Ames & Correll comb. nov.*

Hexopia crurigera Bateman ex Lindley in Bot. Reg. 26 (1840) Misc. p. 46, *nomen*; ex Lindley in Bot. Reg. 30 (1844) Misc. p. 2, *in synon.*

Hexadesmia crurigera Lindley in Bot. Reg. 30 (1844) Misc. p. 2.

Mexico, Guatemala, Salvador and Costa Rica.

Scaphyglottis micrantha (*Lindl.*) *Ames & Correll comb. nov.*

Hexadesmia micrantha Lindley in Bot. Reg. 30 (1844) Misc. p. 2.

Rare in Guatemala and Honduras; widespread and rather common in Costa Rica.

Bothriochilus densiflorus (*Rolfe*) *Ames & Correll comb. nov.*

Coelia densiflora Rolfe in Kew Bull. (1906) 375.

Although Williams, in his contribution concerning the genus *Bothriochilus* (Bot. Mus. Leafl. Harvard Univ. 8 (1940) 145), had no material of *Coelia densiflora* with which to work, he correctly pointed out that this species was undoubtedly referable to *Bothriochilus*. Since then, some excellent material of an inflorescence preserved in alcohol and analytical photographs of the species have been sent to us from Guatemala by Margaret Ward Lewis, thus making it possible for us to study this species and to verify Williams' supposition. *Bothriochilus densiflorus* is unusual in that the inflorescence is composed of numerous (150-200) small white flowers in a dense, capitate raceme.

Apparently endemic to Guatemala.

Stanhopea Lewisae *Ames & Correll sp. nov.*

Herba epiphytica, pseudobulbosa. Pseudobulbus globosus vel ovoideus, vaginis fibrosis scariosis in parte celatus. Folium unicum, terminale; petiolus sulcatus; lamina elliptica, nitens, apice subapiculata, prope basim plicata, cum nervis quinque dorso prominentibus. Inflorescentia a pseudobulbi basi dependens, bracteis siccis imbricatis tecta. Florum bracteae expansae suborbiculari-ellipticae, apiculatae, fibrosae, albidae, valde concavae. Flores grandes, spectabiles, cum ovariis pedicellatis papillosis obtuse trigonis. Sepalum dorsale oblongo-ellipticum, apice carinato rotundatum vel subapiculatum. Sepala lateralia oblique ovato-elliptica, apice carinato late obtusa vel apiculata, valde concava, basi breviter connata. Petala ovato-lanceolata, leviter obliqua, acuta vel breviter acu-

minata. Labellum complicatum, carnosum, rigidum, nitens; dimidium inferius subgloboso-saccatum, intus verrucoso-corrugatum, extus per medium leviter sulcatum, supra carnosissimum et profunde sulcatum, apice bicornutum: cornua incurva, dimidii anterioris margines basales amplectentia; dimidium anterius planum, late rhombico-ovatum, apice rotundato-obtusum, leviter sulcatum. Columna plana, leviter arcuata, supra alata.

Plant epiphytic, composed of a small monophyllous pseudobulb and a pendent several-flowered inflorescence, 3.5–7.5 dm. tall. Pseudobulb globose to ovoid, 4–5 cm. long, 2.5–3 cm. wide at the base, partially concealed by fibrous scarious sheaths. Leaf solitary, at the apex of the pseudobulb; petiole sulcate, 9–12 cm. long, 7–8 mm. in diameter; lamina dark green, glossy, elliptic, subapiculate at the apex, plicate toward the base with five prominent nerves which form dorsal keels, 40–50 cm. long, 12–14 cm. wide. Inflorescence a 3- to 5-flowered raceme, pendent from the base of the pseudobulb and covered with dry hard imbricating bracts which vary from 1.5 to 4 cm. in length. Floral bracts suborbicular-elliptic when spread out, apiculate, fibrous, whitish, deeply concave, with the margins involute, 5–6.5 cm. long, up to 5.5 cm. wide when spread out. Flowers large, showy, creamy white with purple or reddish flecks, with somewhat triangular papillose pedicellate ovaries which are 6.5–9 cm. long. Dorsal sepal oblong-elliptic, rounded or subapiculate at the dorsally keeled apex, 5–5.7 cm. long, 2.5–3 cm. wide. Lateral sepals oblique, ovate-elliptic, broadly obtuse to apiculate at the dorsally keeled apex, deeply concave, united at the base for a short distance and conforming with the basal half of the lip, 5.5–6 cm. long, 3.3–3.7 cm. wide below the middle. Petals slightly oblique, ovate-lanceolate, acute to shortly acuminate, 4–4.7 cm. long, 1.6–1.9 cm. wide near the base. Lip fleshy and

rigid with a glossy wax-like appearance, 4–4.5 cm. long, complex in structure; basal half deep yellow with lines of purple flecks, subglobose-saccate, centrally lightly sulcate beneath, verrucose-corrugated on the interior surface, very fleshy-thickened and deeply sulcate in front, 2.3–2.8 cm. wide, 1.5–2 cm. deep, on each side provided with a short terete horn; horns incurved, adnate to and conforming with the basal margins of the upper half of the lip, the free part about 6 mm. long; upper half of lip flat, whitish, densely flecked with red, broadly rhombic-ovate, rounded-obtuse at the apex, lightly and broadly sulcate, about 2 cm. long and 2–2.5 cm. wide. Column flat, somewhat arcuate, lightly winged above, about 3.5 cm. long and 1.2 cm. wide above the middle.

Stanhopea Lewisae is without close allies. It is distinguished from all other species of *Stanhopea* by the extremely short lateral horns on the lip which are terete and free for only about 6 mm. The rigid apical portion of the lip is also characteristic of this species.

It is rather unusual to find a new species in such a showy genus as *Stanhopea*. We take pleasure in naming this species in honor of its discoverer, Margaret Ward Lewis.

GUATEMALA: Izabal, Los Andes district, near Entre Ríos, altitude about 15 ft., June 12, 1935, *Margaret Ward Lewis 140* (TYPE in Herb. Ames No. 60789).

Campylocentrum microphyllum *Ames & Correll sp. nov.*

Herba epiphytica, prorepens, caules pendentes vel adscendentes simplices vel subinde ramosos, foliorum vaginis celatos ferens. Radices fibrosae, flexuosae. Folia parva, disticha, ad foliorum vaginas articulata, linearia vel lineari-lanceolata, apice oblique retusa, medio longitudinaliter sulcata, marginibus subapicalibus saepissime minute serrulatis; vaginae tubulares, complanatae, margine apicali dentibus rigidis. Racemi unici vel bini, breves,

axillares; rhachide et pedunculo brevi filiformi. Florum bracteae ovatae, acutae, concavae, ciliatae. Flores distichi, perparvi. Sepalum dorsale ovato-oblongum, anguste obtusum, concavum, uninervium. Sepala lateralia anguste triangulari-lanceolata, acuta, concava, uninervia. Petala lanceolata, acuta vel anguste obtusa, uninervia. Labellum rhombico-ovatum, ad apicem subacutum angustatum, infra concavum, uninervium, in calcar conspicuum productum; calcar clavatum, labello longius, prope basim abrupte decurvatum. Columna generis. Capsula ellipsoidalis.

Plant epiphytic, creeping, with pendent or ascending stems up to 15 cm. long; stems occasionally branching, less than 2 mm. in diameter, concealed by the leaf-sheaths. Roots grayish, fibrous, flexuous. Leaves small, distichous, articulated with the leaf-sheaths, linear to linear-lanceolate, very obliquely retuse at the apex, fleshy-coriaceous, grass-green, sulcate along the midrib, usually minutely serrulate on the margins near the apex, 1.4–2.2 cm. long, 3–5.5 mm. wide; leaf-sheaths tubular, compressed, bony-toothed on the apical margin. Inflorescence composed of short racemes produced singly or in pairs in the axils of the upper leaves; rachis and short peduncle filiform, 1.5–2.5 cm. long. Floral bracts ovate, acute, concave, ciliate on the margins, 0.5–1 mm. long. Flowers distichous along the rachis, as many as fifteen. Dorsal sepal ovate-oblong, narrowly obtuse, concave, 1-nerved, 1.2 mm. long, about 0.5 mm. wide below the middle. Lateral sepals narrowly triangular-lanceolate, acute, concave, 1-nerved, 1.8 mm. long, 0.5 mm. wide near the base. Petals lanceolate, narrowly obtuse to acute, 1-nerved, 1.1 mm. long, 0.4 mm. wide. Lip rhombic-ovate, narrowed above to the subacute apex, concave below, with a central nerve, 1.5 mm. long, 1 mm. wide across the widest point, produced below into a prominent spur; spur cla-

vate, exceeding the lip, abruptly decurved near the base, 2 mm. long. Column short, sessile. Capsule ellipsoidal, about 4 mm. long and 2 mm. in diameter.

This species is most closely allied to *C. Brenesii* Schltr. and *C. longicalcaratum* A. & S. It differs from *C. Brenesii* in the longer leaves, more slender rachis, longer spur and simple (not 3-lobed) lip. It differs from *C. longicalcaratum* in the longer leaves, shorter spur and simple (not 3-lobed) lip.

Mexico: Chiapas, system of Volcano Tacaná, Pacific slopes, virgin forest near "La Gloria," about 25 km. north of Tapachula, on trees, long. about 92° 15′, lat. about 15° 4′, alt. about 1200 m., Jan. 29, 1935, *O. Nagel 4426* (Herb. Ames).

Guatemala: San Marcos, epiphyte on tree trunk, leaves fleshy coriaceous, grass-green above, sulcate-nerved along the midrib, paler grass-green beneath, above Finca El Porvenir, Cerro de Mono, south-facing slopes of Volcán Tajumulco, alt. 1400-1700 m., March 9, 1940, *J. A. Steyermark 37376* (Type in Herb. Field Mus. No. 1041877).

We are grateful to Mr. Charles Schweinfurth for his cooperation and assistance in the preparation of this paper.

EXPLANATION OF THE ILLUSTRATIONS

PLATE II. CRANICHIS HIEROGLYPHICA *Ames & Correll.* 1, plant, one half natural size. 2, flower, spread open, ten times natural size. 3, flower, side view, six times natural size. 4, lip and column, side view, ten times natural size. 5, lip, spread out, ten times natural size.

PLATE III. SPIRANTHES STOLONIFERA *Ames & Correll.* 1, plant, natural size. 2, flower, front-side view, twice natural size. 3, flower, front view, twice natural size. 4, lip, column and lateral sepals, spread open, twice natural size. 5, petals and dorsal sepal, spread out, twice natural size.

PLATE IV. GOODYERA MAJOR *Ames & Correll.* 1, plant, one half natural size. 2, flower, side view, five times natural size. 3, flower, spread open, three times natural size. 4, lip, partly spread out, six times natural size.

PLATE V. ERYTHRODES OVATILABIA *Ames & Correll.* 1, plant, natural size. 2, flower, side view, five times natural size. 3, dorsal sepal, five times natural size. 4, lip, partly spread out, five times natural size. 5, lateral sepal, five times natural size. 6, petal, five times natural size.

PLATE VI. LEPANTHES EXCEDENS *Ames & Correll.* 1, plant, twice natural size. 2, sepals, spread out, seven and one half times natural size. 3, lip, from above, twenty times natural size. 4, petal, twenty times natural size. 5, column, dorsal-side view, fifteen times natural size.

PLEUROTHALLIS ANGUSTISEPALA *Ames & Correll.* 6, plant, one half natural size. 7, flower, side view, twice natural size. 8, sepals spread out and column, twice natural size. 9, lip, spread out, five times natural size. 10, petal, seven and one half times natural size.

PLATE VII. PLEUROTHALLIS CRUCILABIA *Ames & Correll.* 1, plant, natural size. 2, flower, side view, five times natural size. 3, lip, side view from above, ten times natural size. 4, lip, spread out, ten times natural size. 5, petal, ten times natural size.

PLEUROTHALLIS TRIANGULIPETALA *Ames & Correll.* 6, plant, natural size. 7, flower, side view, ten times natural size. 8, lip, from above, ten times natural size. 9, lip, side view, ten times natural size. 10, petal, ten times natural size.

PLATE VIII. EPIDENDRUM ALTICOLA *Ames & Correll.* 1, terminal portion of plant, natural size. 2, flower, one and one half times natural size. 3, lip, from above, twice natural size. 4, lateral sepal, from above, twice natural size.

PLATE IX. SCAPHYGLOTTIS MINUTIFLORA *Ames & Correll.* 1, plant, one half natural size. 2, flower, spread open, seven and one half times natural size. 3, flower, side view, seven and one half times natural size. 4, lip, spread out, ten times natural size.

PLATE X. STANHOPEA LEWISAE *Ames & Correll.* 1, plant, one half natural size. 2, lip and column, side view, natural size. 3, lip, from above, natural size. 4, column, anterior surface, natural size.

PLATE XI. CAMPYLOCENTRUM MICROPHYLLUM *Ames & Correll.* 1, plant, natural size. 2, portion of plant showing fruiting racemes, natural size. 3, flower, spread out, ten times natural size. 4, flower, side view, ten times natural size. 5, capsule with remains of flower, five times natural size.

PLATE II

CRANICHIS

hieroglyphica

Ames & Correll

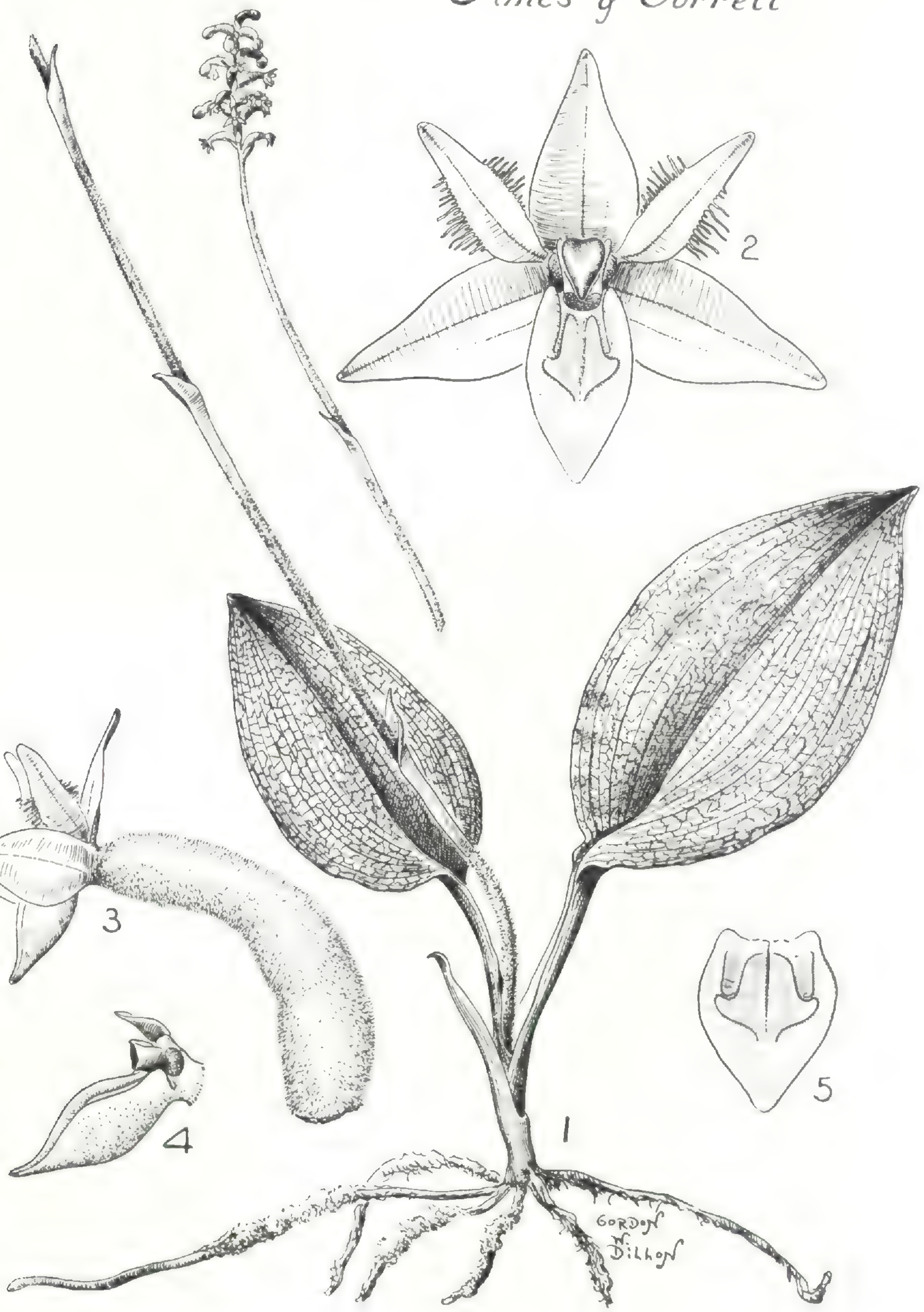


PLATE III

SPIRANTHES

stolonifera Ames & Correll

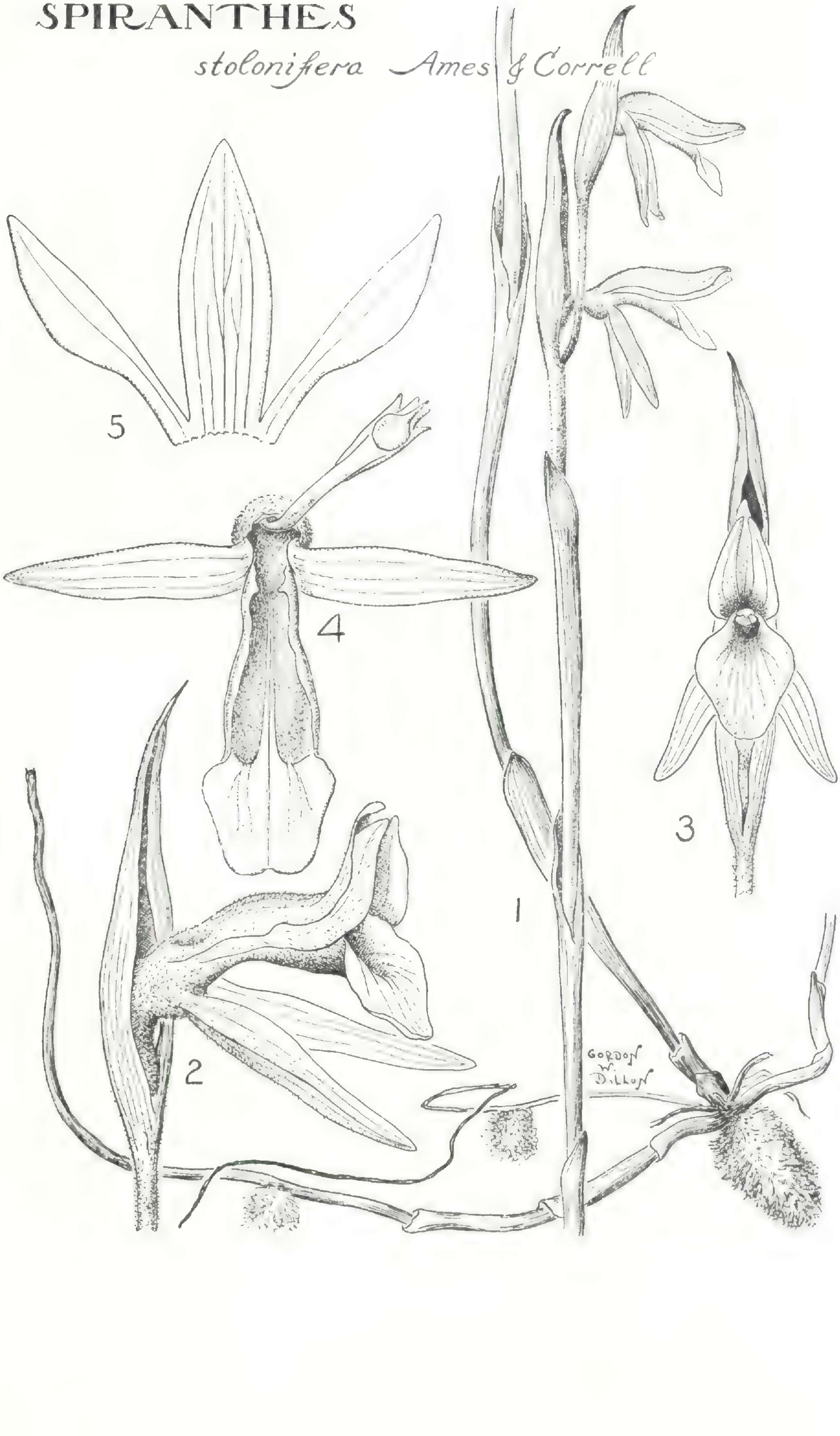
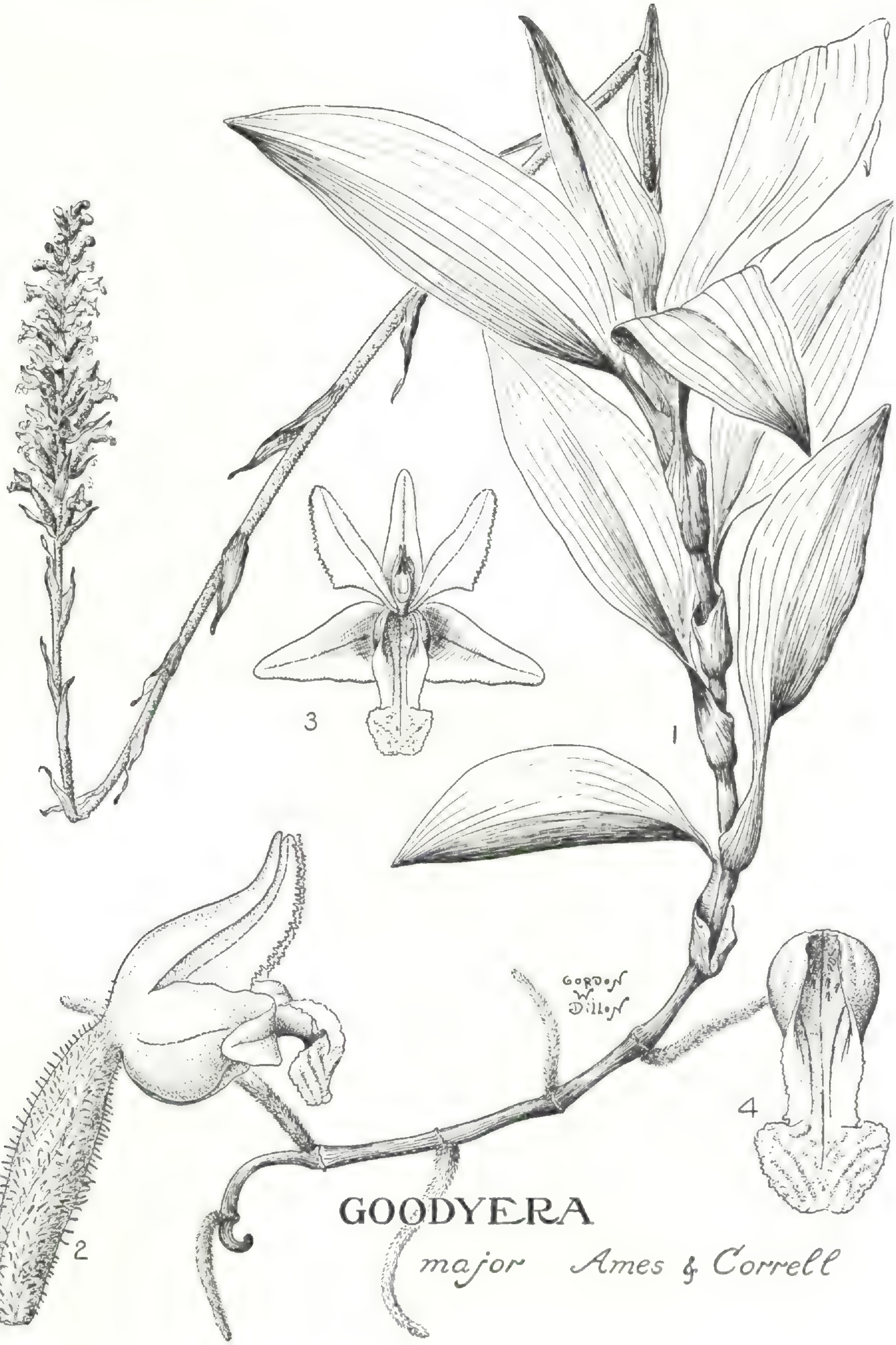


PLATE IV



GOODYERA

major Ames & Correll

PLATE V

ERYTHRODES

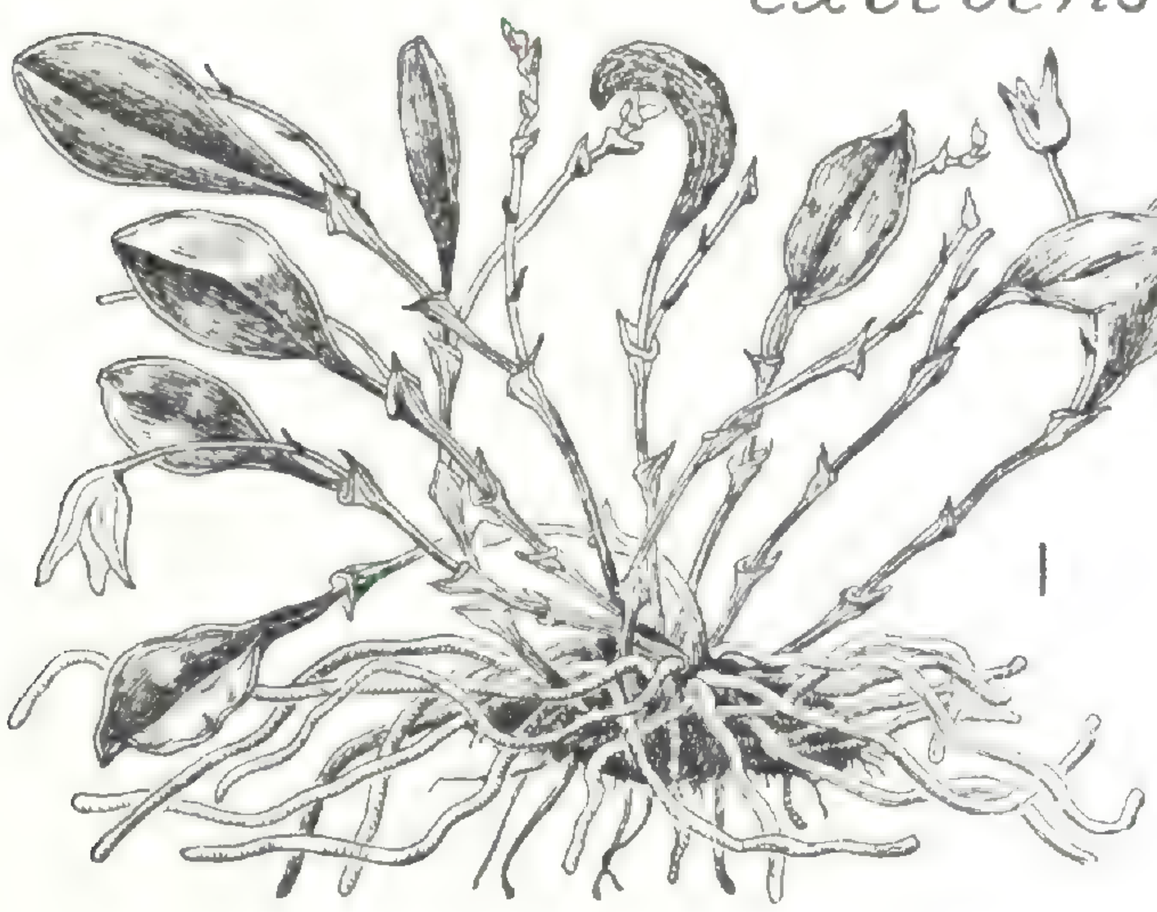
ovatilabia

Ames & Correll

PLATE VI

LEPANTHES

excedens Ames & Correll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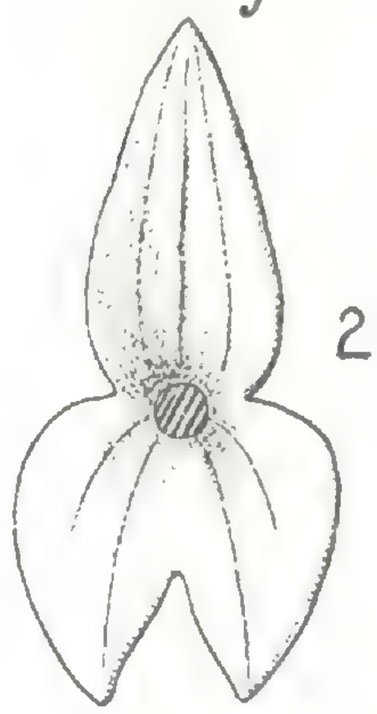
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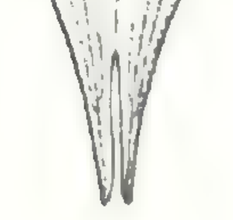
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PLEUROTHALLIS

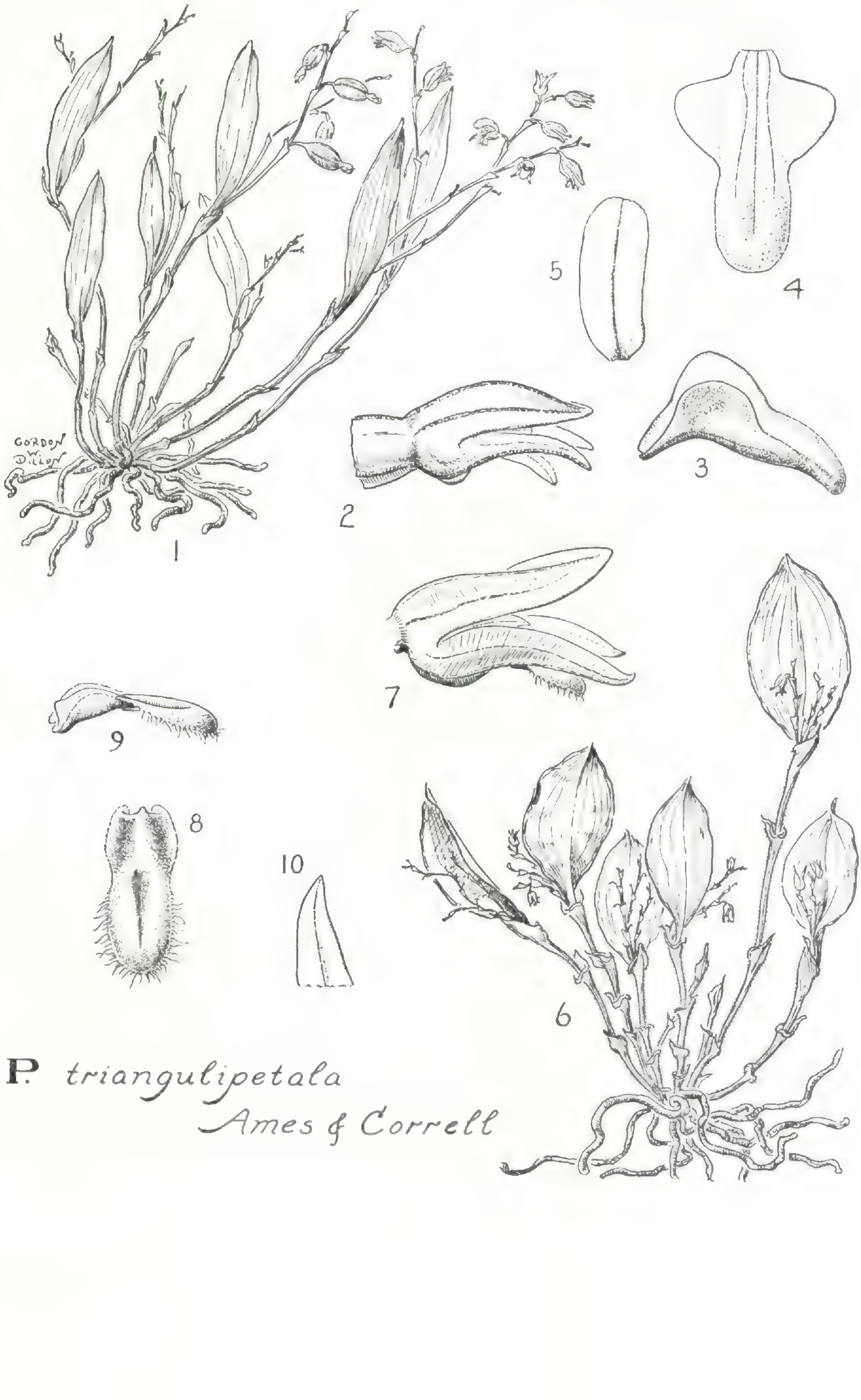
angustisepala Ames & Correll

GORDON W. DILLON

PLATE VII

PLEUROTHALLIS

crucilabia Ames & Correll



P. *triangulipetala*
Ames & Correll

PLATE VIII

EPIDENDRUM

alticola

Ames & Correll

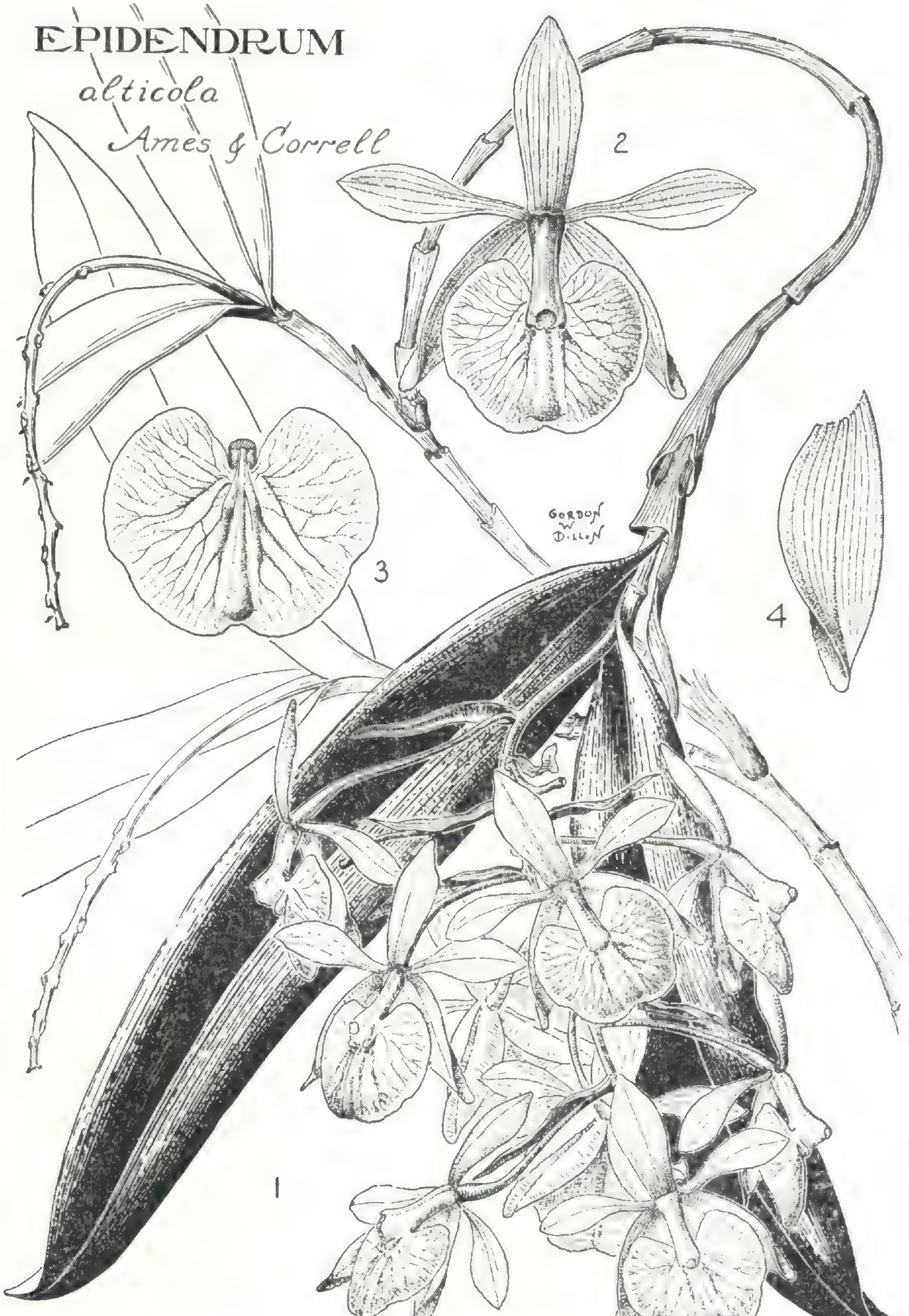
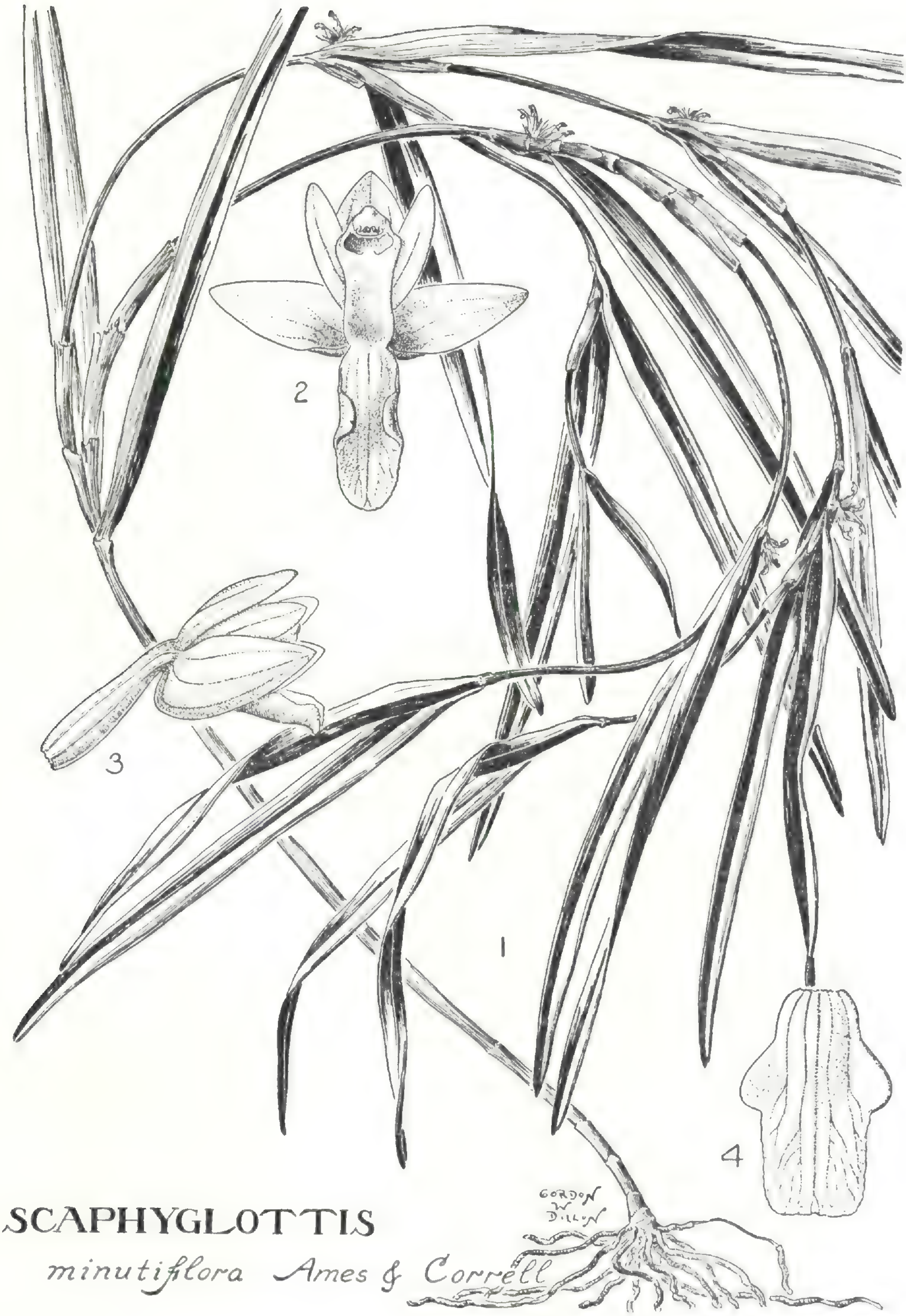


PLATE IX



SCAPHYGLOTTIS

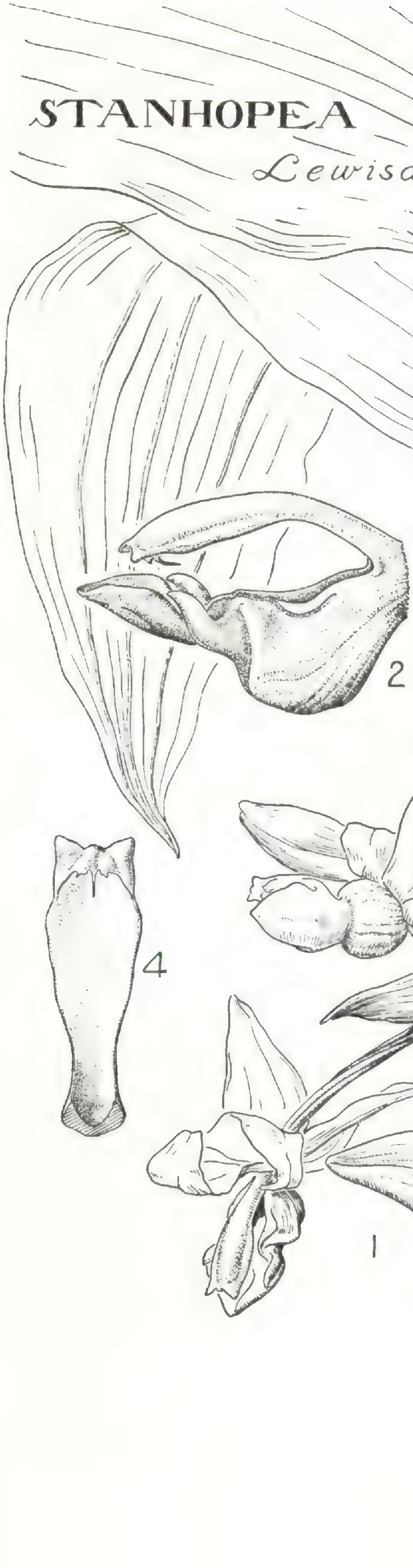
minutiflora Ames & Correll

PLATE X

STANHOPEA

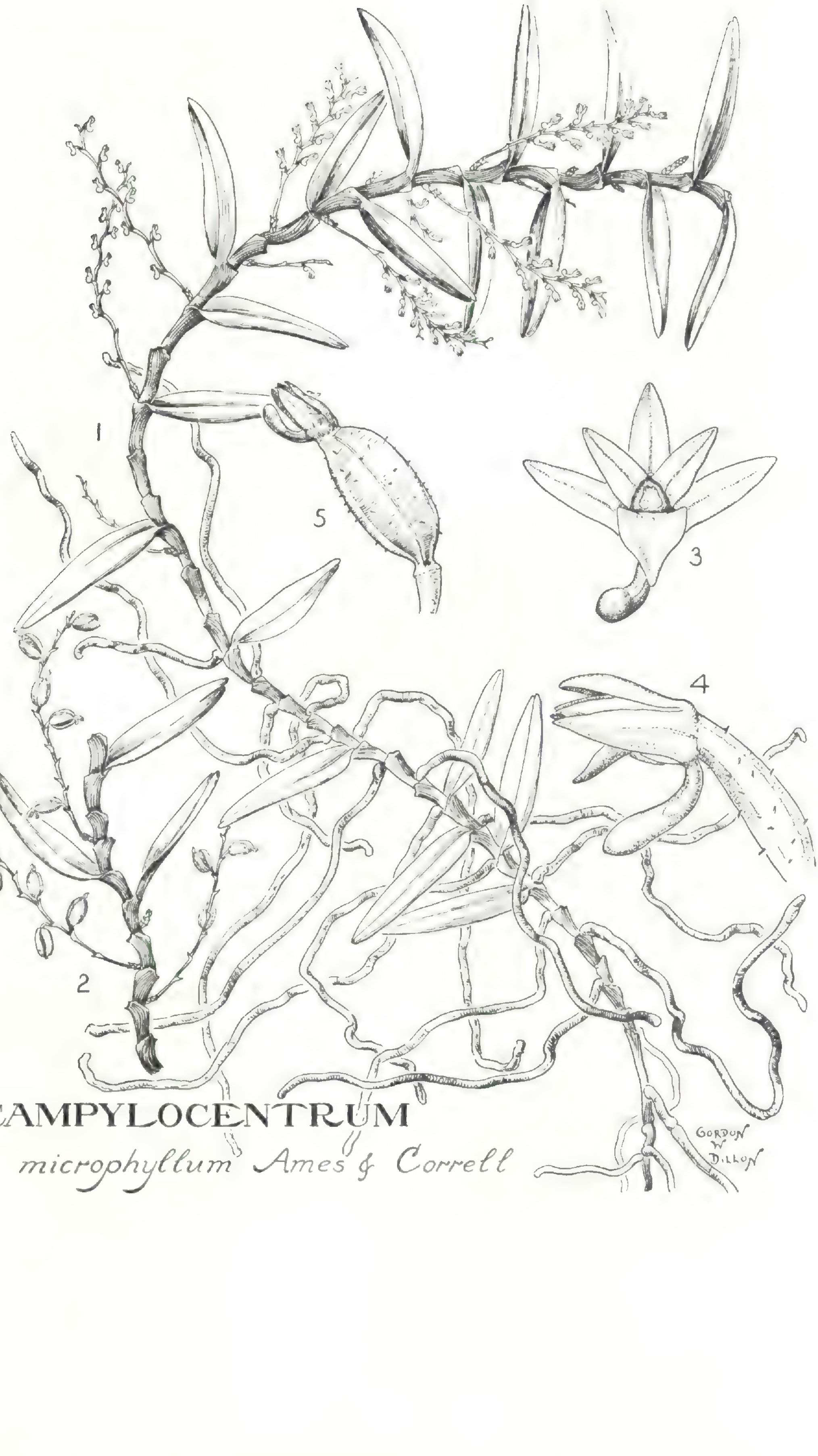
Lewisae

Ames & Correll



GORDON DILLON

PLATE XI



CAMPYLOCENTRUM

microphyllum Ames & Correll

GORDON W DILLON

BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, MARCH 27, 1942 VOL. 10, NO. 5

ORCHIDACEAE PERUVIANAE III

BY

CHARLES SCHWEINFURTH

THE FOLLOWING PAPER, the third of the series treating the novelties in the orchid flora of Peru, elaborates eight species and one variety which appear to be undescribed.

Masdevallia pandurilabia *C. Schweinfurth sp. nov.*

Herba mediocris, caespitosa, cum radicibus numerosis fibratis. Caules breves, vaginis paucis laxis tubulatis maxima pro parte obtecti. Folium caulis apici articulatum, longe petiolatum; lamina obovata vel oblanceolata vel elliptica, apice minute tridenticulato subacuta vel rotundata. Inflorescentia uniflora, folia conspicue excedens, gracilis, saepius laxa. Flos pro genere parvus. Sepala late patentia, similia, infra breviter connata, intus pubescentia, abrupte et longe caudata. Petala oblique triangulari-oblonga, apice inaequaliter tridentata, basi in lobum conspicuum triangularem extensa, antice carinata. Labellum ovato-panduratum, parte basali obovato-rhombica, parte anteriore obovato-cuneata et truncata cum apiculo minuto. Columna generis, cum pede conspicuo libero.

Plant medium-sized, caespitose, up to 20 cm. high in the dried specimen. Roots numerous, fibrous, glabrous. Stem short, up to 5.5 cm. high, entirely or mostly concealed by about three loose imbricating truncate sheaths of which the uppermost is much the largest. Leaf solitary, articulated to the apex of the stem, long-petioled;

lamina obovate to oblanceolate or elliptic, up to 7 cm. long and 2.3 cm. wide, subacute to rounded at the minutely tridenticulate apex, more or less long-narrowed below, chartaceous, with three prominent nerves in the dried specimen; petiole slender, gradually dilated to the base of the leaf, up to 5 cm. long. Inflorescence 1-flowered, conspicuously surpassing the leaves, arising from the stem below its apex, slender, erect to arcuate or flexuous, up to 19 cm. long to the base of the flower, provided with several inconspicuous tubular sheaths—two or three at the base, one on the lower or middle portion and one near the flower. Flower rather small for the genus, yellowish brown with the "central lip dark red." Sepals wide-spreading, with abrupt long tails, connate below into a very shallow cup, pubescent on the inner surface with more or less clustered or stellate short hairs. Dorsal sepal about 4.1 cm. long; cup about 5.5 mm. high; free portion suborbicular-ovate, concave, with an abrupt tail which is about 3.3 cm. long, slender, fleshy and subterete. Lateral sepals similar; free portion obliquely semiorbicular-ovate, with an abrupt tail about 3.2 cm. long. Petals very obliquely triangular-oblong, about 4.3 mm. long, obliquely tridentate at the apex with the lateral teeth subacute and the middle tooth shorter and blunter, produced at the base in front into a triangular-decurved lobule; on the upper part and close to the anterior margin is a low fleshy keel which extends to the tip of the basal lobule. Lip nearly as long as the petals, somewhat recurved in natural position with the basal part lightly concave, the central part sulcate with the sides revolute, and the apical part with reflexed sides; when expanded the lamina is about 4 mm. long, ovate-pandurate with the basal part obovate-rhombic and the anterior part obovate-cuneate, broadly truncate and with a central fleshy thickening prolonged into a small abrupt apicule; disc at base with

a pair of very small approximate semicircular calli. Column a little shorter than the petals, arcuate, irregularly denticulate above, produced into a foot which has a prominent free cuneate-ligulate apex.

Masdevallia pandurilabia is closely allied to the Colombian *M. Arminii* Reichb. f., but differs in having a more prominent basal lobe to the petals, a more deeply pandurate lip, and no angle at the base of the column, as well as in the color of the flowers. It varies from *M. triangularis* Reichb. f. in having peduncles much surpassing the leaf and in having a dissimilar lip.

HUANUCO: Panao, at about 2770 meters altitude, on shrubby slopes, flowers yellowish brown with the "central lip dark red," May 10, 1923, *J. Francis Macbride 3625* (TYPE in Herb. Field Mus. No. 534689; DUPLICATE TYPE in Herb. Ames No. 59573).

Stelis concaviflora *C. Schweinfurth sp. nov.*

Herba mediocris, caespitosa ut videtur. Caules densi, unifoliati, vaginis laxis tubulatis evanidis omnino celati. Folium saepissime anguste elliptico-oblongum, apice acutum, basi subpetiolato-angustatum, valde coriaceum. Inflorescentia unica, folio duplo longior, subdense multiflora. Flores parvi, secundi, bilabiati, glabri, carnosi. Sepalum dorsale sepalis lateralibus alte connatum, trinervium, parte libera late ovata. Sepala lateralia in laminam concavo-saccatam, fere suborbicularem omnino connata. Petala minuta, transverse subquadrato-ovata, apice lato incrassato. Labellum valde concavum cum lateribus erectis, in positu naturali ovatum, dimidio basali callo carnoso bilobato occupato. Columna minuta, generis.

Plant medium-sized, up to 18 cm. high, apparently caespitose. Roots numerous, fibrous, glabrous. Stems densely clustered, about 7.5 cm. or less tall, loosely clothed with two or three tubular, scarious evanescent sheaths of which the uppermost is much the largest, unifoliate at the apex. Leaf narrowly elliptic-oblong or ob-

lanceolate-oblong, acute or minutely tridenticulate at the apex, narrowed to a short indistinct petiole, up to 7.8 cm. long and 1.25 cm. wide, rigid and coriaceous in the dried specimen. Inflorescence solitary, about twice as long as the leaf, up to 13.3 cm. long, arising from near the apex of the stem where it is invested by a tubular membranaceous, long-acuminate sheath. Peduncle 4.7–8.7 cm. long, provided (in the middle or above) with a single short infundibuliform sheath. Raceme many-flowered, subdense above, rather lax below, secund. Flowers small, bilabiate, glabrous, rather fleshy, light green throughout. Dorsal sepal connate with the lateral sepals for about one third of the length, about 6.3 mm. long; free part broadly ovate, obtuse or subacute, 3-nerved, about 4.8 mm. long and 4.1 mm. wide. Lateral sepals shorter, entirely connate into a deeply concave and basally saccate lamina which is 6-nerved lightly retuse and apparently suborbicular when expanded, nearly 6 mm. long and broad. Petals minute, transversely subquadrate-ovate, subacute at the broad fleshy-thickened apex, 3-nerved, about 1 mm. long. Lip very small, deeply concave, about 1.5 mm. long, ovate or rhombic-ovate with upcurved sides, obtuse or subacute, the lower half being wholly occupied (except near the margins) by a fleshy convex bilobed callus. Column very short and stout, about equaling the petals, dilated from the base, deeply 3-lobed above.

Stelis concaviflora differs from *S. rhomboglossa* Schltr. in having glabrous flowers and a dissimilar lip. It diverges from *S. pleurothalloides* Ames in having connate lateral sepals and a different lip.

Apurimac: Prov. Andahuaylas, Quebrada, north of Chincheros, at 2800 meters altitude, among cliffs and on gravelly clay banks, "fl. light pale green throughout," February 27, 1939, *H. E. Stork & O. B. Horton 10765* (Type in Herb. Field Mus. No. 1051119).

Stelis diffusa *C. Schweinfurth sp. nov.*

Herba mediocris, caespitosa. Caules tenues, vaginis pluribus tubulatis evanidis obtecti. Folium longe petiolatum; lamina elliptica (rarenter elliptico-linearis), obtusa, basi cuneata; petiolus gracilis, canaliculatus. Inflorescentiae unicae vel plures, laxiflorae, plusminusve diffusae, saepissime quam folium breviores. Flores parvi. Sepala basi connata, trinervia, intus pubescentia. Sepalum dorsale elliptico-ovatum. Sepala lateralia subaequalia, dorso leviter carinata. Petala minuta, rotundato-obovata vel cuneato-subquadrata, apice incrassato late rotundata vel subtruncata. Labellum petalis simile, cuneato-subquadratum, apice late rotundatum et medio minute apiculatum; discus marginibus exceptis incrassatus. Columna generis.

Plant medium-sized, caespitose, up to 25 cm. high. Roots numerous, fibrous, filiform, glabrous. Rhizome abbreviated. Stem flexuous to suberect, up to 15 cm. long, mostly concealed by approximately three tubular close evanescent sheaths of which the uppermost is the longest. Leaf solitary at the apex of the stem, erect, long-petioled, chartaceous in the dried specimen; lamina elliptic to (rarely) linear-elliptic, up to 9.5 cm. long and 2.8 cm. wide, obtuse with a minutely tridenticulate apex, cuneate below, with the mid-nerve prominent beneath; petiole slender, channelled, up to 3.5 cm. long. Inflorescences one to five, rising from just below the leaf, usually shorter than the leaf but rarely a little exceeding the leaf, racemose, laxly several- to many-flowered, more or less diffuse, up to 11.5 cm. long. Flowers small. Sepals connate at the base, subequal, 3-nerved, pubescent on the inner surface. Dorsal sepal elliptic-ovate, up to 3.5 mm. long, subacute to obtuse. Lateral sepals similar in shape, up to 3 mm. long, subobtuse, lightly carinate without along the mid-nerve. Petals minute, cuneate-subquadrate

or rounded-obovate, fleshy-thickened near the truncate or broadly rounded apex, up to 1 mm. long and 1.5 mm. wide at the apex. Lip similar to the petals but rather smaller, cuneate-subquadrate, nearly 1 mm. long and somewhat wider above, broadly rounded-truncate at the apex with a minute incurved apicule in the center, with the entire inner surface of the disc (except the margins) covered by a fleshy thickening. Column of the genus, dilated from the base, 3-lobed at the apex.

Stelis diffusa seems to be without close allies. The lip resembles that of *S. Endresii* Reichb.f.

HUANUCO: Huacachi, near Muña, mountains, at about 2000 meters altitude, May 20–June 1, 1923, *J. Francis Macbride 4148* (TYPE in Herb. Field Mus. No. 535222; DUPLICATE TYPE in Herb. Ames No. 59571); Yanano, at about 1850 meters altitude, on mossy tree, flowers greenish white with reddish center, May 13-16, 1923, *Macbride 3845*.

Stelis grandibracteata *C. Schweinfurth sp. nov.*

Herba mediocris, epiphytica, rhizomate repenti. Caules adscendentes, vaginis tubulatis evanidis omnino celati, apice monophylli. Folium breviter petiolatum; lamina elliptica vel oblongo-elliptica, apice obtuso minute tridenticulata. Inflorescentia unica, folium conspicue superans, racemosa. Flores subdensi, parvi, numerosi, secundi, cum bracteis patentibus conspicuis. Sepala paene usque ad medium connata, trinervia, similia. Sepalum dorsale (pars libera) late ovatum. Sepala lateralia (partes liberae) rotundato-ovata. Petala minuta, rhombica, parte superiore multo incrassata. Labellum concavum, carnosum, ovatum, apice rotundatum, basi transverse carnoso-carinatum. Columna generis.

Plant medium-sized, epiphytic, ascending from a creeping rhizome, up to 19 cm. high. Roots numerous, fibrous, glabrous. Stems apparently approximate in pairs. Stems (when mature) about 6 cm. long, concealed by about three tubular evanescent sheaths of which the

uppermost is the longest, unifoliate at the summit. Leaf elliptic or oblong-elliptic, erect, shortly and rather abruptly petioled; lamina obtuse to rounded and minutely tridenticulate at the apex, broadly cuneate at the base, up to 8.5 cm. long and 2.8 cm. wide; petiole stout, channelled, about 6 mm. long. Inflorescence solitary, erect, much exceeding the leaf, about 13.5 cm. long. Peduncle up to the raceme about 5.7 cm. long, clasped at base by a conduplicate spathe and above by two remote infundibuliform sheathing bracts. Raceme about 7.5 cm. long, subdensely many-flowered, with secund flowers. Floral bracts conspicuous, spreading, rotundate-ovate, apiculate, with auriculate-clasping base, membranaceous, up to 6.5 mm. long. Flowers rather small, glabrous, cupuliform. Sepals connate almost to the middle, 3-nerved. Dorsal sepal about 4.8 mm. long; free portion broadly ovate, obtuse to subacute, about 3.7 mm. wide. Lateral sepals round-ovate, a little shorter and broader than the dorsal sepal. Petals minute, transversely rhombic-ovate with a fleshy-thickened anterior half, 3-nerved, rounded at the apex, about 1.7 mm. long. Lip about equal to the petals, fleshy, concave in natural position, sessile, ovate, rounded at the apex, with a transverse fleshy bilobed ridge across the rather abruptly dilated base, about 1.9 mm. long and slightly narrower across the lower portion. Column very short and stout, about 2.2 mm. long, slightly dilated from the base, irregularly lobulate above.

Stelis grandibracteata is apparently allied to *S. loxensis* Lindl., but differs in having larger elliptic leaves and dissimilar lateral sepals. In floral structure it is reminiscent of *S. thecoglossa* Reichb. f., but the conspicuous spreading floral bracts are diagnostic.

Cuzco: "Pillahuata," Cerro de Cusilluyoc, along Río Pillahuata, at 2300-2400 meters altitude, epiphytic in forest, perianth "dark perilla purple," May 3-6, 1925, *Francis W. Pennell 14006* (Type in Herb. Ames No. 59569).

Stelis Lindleyana *Cogniaux* var. **carnosior** *C. Schweinfurth var. nov.*

Herba foliis non supra angustatis et floribus carnosis a specie differt.

Very similar to the type but differing in the following particulars. Leaves generally not conspicuously narrowed above, up to 18.4 cm. long. Inflorescence up to 21 cm. long. Flowers fleshy in texture, with the dorsal sepal indistinctly 5-nerved and the lateral sepals 3- or indistinctly 4-nerved.

JUNIN: San Ramón, at 900-1300 meters altitude, epiphyte in dry woods, perianth segments greenish yellow, June 9, 12, 1929, *E. P. Killip & A. C. Smith 24753* (TYPE in Herb. Ames No. 60273; DUPLICATE TYPE in Herb. Field Mus. No. 622172).

Stelis minuta *C. Schweinfurth sp. nov.*

Herba minuta, caespitosa. Caules breves, tenues, a basi decumbenti patentes, vaginis arctis tubulatis obtecti. Folium unicum, crasse coriaceum et conduplicatum, expansum lineari-oblanceolatum, apice minute tridenticulatum. Inflorescentia unica, racemosa, folio brevior, densius pauci-vel multiflora. Flores minuti. Sepala basi connata, trinervia, acuta. Sepalum dorsale rotundato-ovatum. Sepala lateralia similia, paulo minora, leviter obliqua. Petala minutissima, rhombico-obovata, apice lato incrassato. Labellum petalis subaequale, subquadrato-ovatum, parte inferiore valde incrassata, parte anteriore excavata et minute triangulari-acuta. Columna generis.

Plant minute, caespitose, up to 7.5 cm. tall. Roots numerous, fibrous, glabrous. Stems short, slender, erect-spreading from a decumbent base, up to 3.7 cm. long, concealed by about three close tubular evanescent sheaths of which the uppermost is the longest and nearly reaches the summit of the stem. Leaf solitary and terminal,

thickly coriaceous and conduplicate in the dried specimen, linear-oblanceolate, minutely tridenticulate at the apex, tapering below into a scarcely petioled base, up to 4.3 cm. long and 6 mm. wide above the middle (when softened in hot water). Inflorescence racemose, solitary, shorter than the leaf, rather densely flowered down to the base, bearing several to many flowers, up to 3 cm. long; rachis rather diffuse, filiform. Floral bracts infundibuliform, spreading, about 1 mm. long. Flowers minute, rather fleshy. Sepals connate near the base, similar, 3-nerved. Dorsal sepal rotund-ovate, acute, about 1.5 mm. long. Lateral sepals a little smaller, apiculate, rather oblique, more or less carinate without. Petals very minute, concave, when expanded rhombic-obovate and about 0.6 mm. long, 1-nerved, thickened at the broad apex. Lip about as long as the petals, subquadrate-ovate with upcurved sides when viewed from the front, much thickened to a point above the middle, excavated in front, with a triangular-acute incurved apex. Column about equaling the petals, dilated from the base, 3-lobed above.

Stelis minuta is a smaller plant than *S. lamellata* Lindl. with racemes shorter than the leaf and a rather different lip. It differs from *S. graminea* Lindl. in lacking a distinct long petiole, in not having 1-nerved sepals and in its dissimilar lip.

JUNIN: Chanchamayo Valley, at 1800 meters altitude, March "1924-1927," *Carlos Schunke s.n.* (TYPE in Herb. Field Mus. No. 571642; FRAGMENT OF TYPE in Herb. Ames No. 59570); same locality, at 1600 meters altitude, August 1930, *Schunke 1668* (flowers old and in poor condition).

Lepanthes alticola *C. Schweinfurth sp. nov.*

Herba pusilla, caespitosa. Caules filiformes, vaginis paucis arctis omnino vestiti. Folium oblanceolato-ellipticum vel elliptico-obovatum, acutum, ad basim petio-

latam sensim angustatum. Inflorescentiae saepissime unicae, laxe pauci- vel multiflorae, diffusae, rachide fractiflexa. Sepalum dorsale ovatum, subito caudatum, trinervium, concavum. Sepala lateralia dimidio inferiore connata, oblique lanceolata, longe acuminata, cellulari-ciliata. Petala minora, transverse bilobata, lobo dorsali paulo majore et oblongo-ovato. Labellum trilobatum; lobi laterales conspicui, oblique triangulares, apice peltati; lobus medius minutus, triangulari-linearis. Columna arcuata, apice dilatata.

Plant small, delicate, caespitose. Roots fibrous, glabrous. Stems filiform, up to 5 cm. high, entirely concealed by four or five close tubular sheaths. Cauline sheaths with longitudinal microscopically hispid nerves, terminating in an infundibuliform hispid marginate mucronate mouth. Leaf small, oblanceolate-elliptic or elliptic-obovate, acute and minutely tridenticulate at the apex, gradually narrowed to a petiolate base, up to 3.9 cm. long and 9 mm. wide, subcoriaceous, marginate. Inflorescences usually one (occasionally two), more or less surpassing the leaf, loosely several- to many-flowered, diffuse or arcuate, up to 16 cm. long, with strongly fractiflex rachis. Floral bracts originating below the pedicel, infundibuliform, long-awned, about equaling the pedicellate ovary. Flowers membranaceous, ringent. Dorsal sepal ovate, about 7.5 mm. long and 3.9 mm. wide, rather abruptly caudate above with the cauda about 2.5–3 mm. long, concave, 3-nerved with the nerves carinate without (the keels being rather high and with irregular margins). Lateral sepals connate for nearly half their length, about 7.5 mm. long and 4 mm. wide across the connate portion, obliquely lanceolate, long-acuminate, irregularly cellular-ciliate, obscurely 2-nerved with the conspicuous inner nerve carinate on the outer surface. Petals much smaller than the sepals, adnate to the column, finely pubescent,

transversely bilobed with the lobules set at an obtuse angle; posterior lobule obliquely oblong-ovate, obtuse, about 2 mm. long; anterior lobule oblong-lanceolate, obtuse, little shorter but much narrower than the posterior lobule. Lip adnate to the column in front, 3-lobed; lateral lobes prominent, obliquely triangular, about 2 mm. long, with a peltate lanceolate apex which is about 2 mm. wide; mid-lobe minute, triangular-linear. Column stout, arcuate, dilated above, about 2 mm. long.

Lepanthes alticola is apparently related to the Colombian *L. costata* Reichb.f., but differs in having dissimilar petals and lip. It varies from the Bolivian *L. rupicola* Schltr. in its longer stems, larger leaves and dissimilar petals.

HUANUCO: Tambo de Vaca, at about 4000 meters altitude, "fls. pale yellow except for red bases of central parts," June 10-24, 1923, *J. Francis Macbride 4461*. (TYPE in Herb. Field Mus. No. 535547; DUPLICATE TYPE in Herb. Ames No. 59566).

Lepanthes caudatisepala *C. Schweinfurth sp. nov.*

Herba pro genere elata, caespitosa. Caules vaginis pluribus cylindraceo-tubulatis cum ostio patenti hispidociliato obtecti. Folium oblongo-ovatum vel ellipticum, abrupte acuminatum, breviter petiolatum, chartaceum. Inflorescentiae saepissime duae, folio multo breviores, arcuatae, pergraciles. Flos membranaceus. Sepalum dorsale ovatum, abrupte caudato-acuminatum, trinervium. Sepala lateralia obliquissime ovata, abrupte caudato-acuminata, parte basali connata, binervia. Petala sepalis multo minora, transversa, bilobata, lobulo dorsali obovato-quadrato, lobulo anteriore oblique triangulari-lanceolato. Labellum trilobatum; lobi laterales peltati cum apice conspicuo transverse oblongo-elliptico; lobus medius minutus, profunde bidentatus. Columna generis.

Plant large for the genus, up to 30 cm. tall, caespitose. Roots fibrous, glabrous, stout for the plant. Stems en-

tirely concealed by sheaths, up to 20 cm. long. Cauline sheaths numerous, tubular-cylindric, close, glabrous or obscurely fine-hispid along the longitudinal nerves, terminating in loose infundibuliform mouths which are long-acuminate, marginate and prominently hispid-ciliate. Leaf elliptic to oblong-ovate, rather abruptly acuminate with a minutely tridentate apex, broadly cuneate below, up to 10.5 cm. long and 3 cm. wide, chartaceous, marginate, many-nerved with three more conspicuous ones; petiole short, channelled, up to 1 cm. long. Inflorescences one or two, much shorter than the leaf, arcuate, up to 8.5 cm. long, few- to many-flowered, densely flowered above but very loose below, filiform, with a fractiflex rachis. Flower membranaceous. Sepals glabrous. Dorsal sepal ovate, abruptly caudate-acuminate, 3-nerved (the nerves being dorsally carinate with minutely denticulate keels), about 7 mm. long and 4.8 mm. wide near the base. Lateral sepals very obliquely ovate, abruptly caudate-acuminate, connate for about one third of their length, about 7.4 mm. long and 6.2 mm. wide across the connate portion, 2-nerved with the nerves dorsally carinate. Petals much smaller than the sepals, transverse, horizontal, bilobed, minutely cellular-pubescent, about 1.5 mm. long in the middle and 4.5 mm. wide; posterior lobule obliquely obovate-quadrate, separated from the anterior lobule by a blunt apicule; anterior lobule obliquely triangular-lanceolate, lightly incurved, obtuse, little shorter but much narrower than the posterior lobule. Lip adnate to the middle of the column, 3-lobed; lateral lobes peltate from a short broad subquadrate claw, with the apical portion transversely oblong-elliptic and about 2.5 mm. broad; mid-lobe minute, subquadrate in outline, sharply bidentate. Column about 2 mm. long, slightly arcuate.

Lepanthes caudatisepala appears to be most nearly al-

lied to the Central American members of the genus, *L. eciliata* Schltr. and *L. Wendlandii* Reichb.f. It differs from both species, however, in the shape of the lateral sepals and petals.

HUANUCO: Muña, trail to Tambo de Vaca, at about 2460 meters altitude, at base of tree, flowers "dull yellow except for small red central part," June 5-7, 1923, *J. Francis Macbride 4273* (TYPE in Herb. Field Mus. No. 535355).

Lepanthes pumila *C. Schweinfurth sp. nov.*

Herba pusilla, epiphytica, caespitosa. Caules filiformes, patentes, vaginis arctis omnino celati. Vaginae plures, tubulari-cylindraceae, minute hispidae, in ostia ovata marginata hispido-ciliata extensae. Folia ovata vel elliptica, acuta vel obtusa, perbreviter petiolata. Inflorescentiae unicae vel plures, folio multo breviores, uni- vel pauciflorae. Sepalum dorsale oblongo-ovatum, abrupte acutum, trinervium. Sepala lateralia obliquissime ovata, parte basali connata, abrupte acuta, binervia. Petala sepalis breviora, transverse bilobata, lobulis subaequilongis sed lobulo anteriore angustiore. Labellum trilobatum, columnae adnatum; lobi laterales peltati cum ungui obliquissime triangulari, apice lato anguste oblongo; lobus medius multo minor, ellipticus, profunde concavus. Columna arcuata, apice leviter dilatata.

Plant epiphytic, caespitose, small and slender, up to 8 cm. tall, very variable in size. Roots fibrous, flexuous, glabrous. Stems filiform, spreading, up to 7.6 cm. long, entirely concealed by close evanescent sheaths. Cauline sheaths commonly five to seven, tubular-cylindric, minutely hispidulose on the longitudinal nerves, terminating in ovate spreading mouths which are marginate, acuminate and bristly-ciliate (the uppermost sheath is more prominently infundibuliform above). Leaf ovate to elliptic (rarely broadly oval), acute to obtuse with a more or less distinctly tridenticulate apex, cuneate or

rounded below with a very short petiole, marginate, chartaceous; lamina up to 2.3 cm. long and 1.45 cm. wide; petiole channelled, up to 3 mm. long. Inflorescences one to several, axillary, very short, reaching to about the middle of the leaf, 1- to 8-flowered. Flowers rather small. Sepals glabrous, membranaceous. Dorsal sepal oblong-ovate, abruptly acute, 3-nerved, about 4 mm. long and 2.1 mm. wide. Lateral sepals a little smaller, very obliquely ovate, abruptly acute, 2-nerved, connate near the base, about 3.5 mm. long and 2.4 mm. wide near the base of the free part. Petals smaller than the sepals, transversely bilobed with lobules horizontal, about 1.3 mm. long, up to 3 mm. wide; posterior lobe obliquely ovate to suborbicular, broadly obtuse to rounded; anterior lobe obliquely triangular-ovate, obtuse, about as long as but narrower than the posterior lobe. Lip adnate to the column near the base, 3-lobed; lateral lobes peltate, with an obliquely triangular claw and a narrowly oblong apex (slightly broader toward the front) which is about 2 mm. across; mid-lobe much smaller, elliptic, deeply concave, finely pubescent without. Column arcuate, slightly dilated above, about 1.8 mm. long.

Lepanthes pumila appears to be very similar to the Bolivian *L. sillarensis* Schltr., but usually has larger proportions throughout, especially much broader leaves and petals and a rather dissimilar lip. It differs from *L. duidensis* A. & S. and *L. Schnitteri* Schltr. in its larger size, 2- to 3-nerved sepals and dissimilar petals. It varies from the Costa Rican *L. decipiens* A. & S. in its commonly larger size and in its dissimilar lateral sepals and petals.

AYACUCHO: Aina, between Huanta and Río Apurimac, at 750-1000 meters altitude, epiphyte in open woods, "3 segments grass-green; lip and column deep red," May 7, 17, 1929, *E. P. Killip & A. C. Smith 23151*. (TYPE in Herb. Ames No. 59565; DUPLICATE TYPE in Herb. Field Mus. No. 616594); same locality and date, epiphyte in dense forest, "perianth segments rose-red, green at apex," *Killip & Smith 22537*.

EXPLANATION OF THE ILLUSTRATIONS

PLATE XII. MASDEVALLIA PANDURILABIA *C. Schweinf.* 1, plant, natural size. 2, flower expanded, from above, twice natural size. 3, column with foot, from side, five times natural size. 4, petal, five times natural size. 5, lip from side, five times natural size. 6, lip from above, expanded, five times natural size.

PLATE XIII. STELIS CONCAVIFLORA *C. Schweinf.* 1, plant, one half natural size. 2, flower, from side, five times natural size. 3, petal, ten times natural size. 4, lip, from above, fifteen times natural size. 5, lip from side, fifteen times natural size.

STELIS GRANDIBRACTEATA *C. Schweinf.* 6, plant, one half natural size. 7, flower, from above, five times natural size. 8, petal, ten times natural size. 9, lip from above, ten times natural size. 10, lip, from side, ten times natural size.

PLATE XIV. STELIS DIFFUSA *C. Schweinf.* 1, plant, one half natural size. 2, flower, from above, five times natural size. 3, lip, from above, fifteen times natural size. 4, petal, ten times natural size.

STELIS MINUTA *C. Schweinf.* 5, plant, natural size. 6, flower, from above, twenty times natural size. 7, lip, from above, thirty times natural size. 8, petal, thirty times natural size.

PLATE XV. LEPANTHES CAUDATISEPALA *C. Schweinf.*
1, plant, one half natural size. 2, flower, from above, five times natural size. 3, lip, from above, ten times natural size. 4, petal, five times natural size.

PLATE XVI. LEPANTHES PUMILA *C. Schweinf.*
1, plant, natural size. 2, flower, from above, five times natural size. 3, petal, ten times natural size. 4. lip, from above, ten times natural size.

LEPANTHES ALTICOLA *C. Schweinf.* 5, plant, natural size. 6, flower, from above, four times natural size. 7, petal, ten times natural size. 8, lateral lobe of lip, from below and mid-lobe of lip from above expanded, fifteen times natural size. 9, lateral lobe and mid-lobe of lip, from above, natural position, fifteen times natural size.

PLATE XII

MASDEVALLIA

pandurilabia

C. Schweinf.

PLATE XIII

STELIS concaviflora C. Schweinf.

S. grandibracteata C. Schweinf.

PLATE XIV

STELIS *diffusa* C. Schweinf.

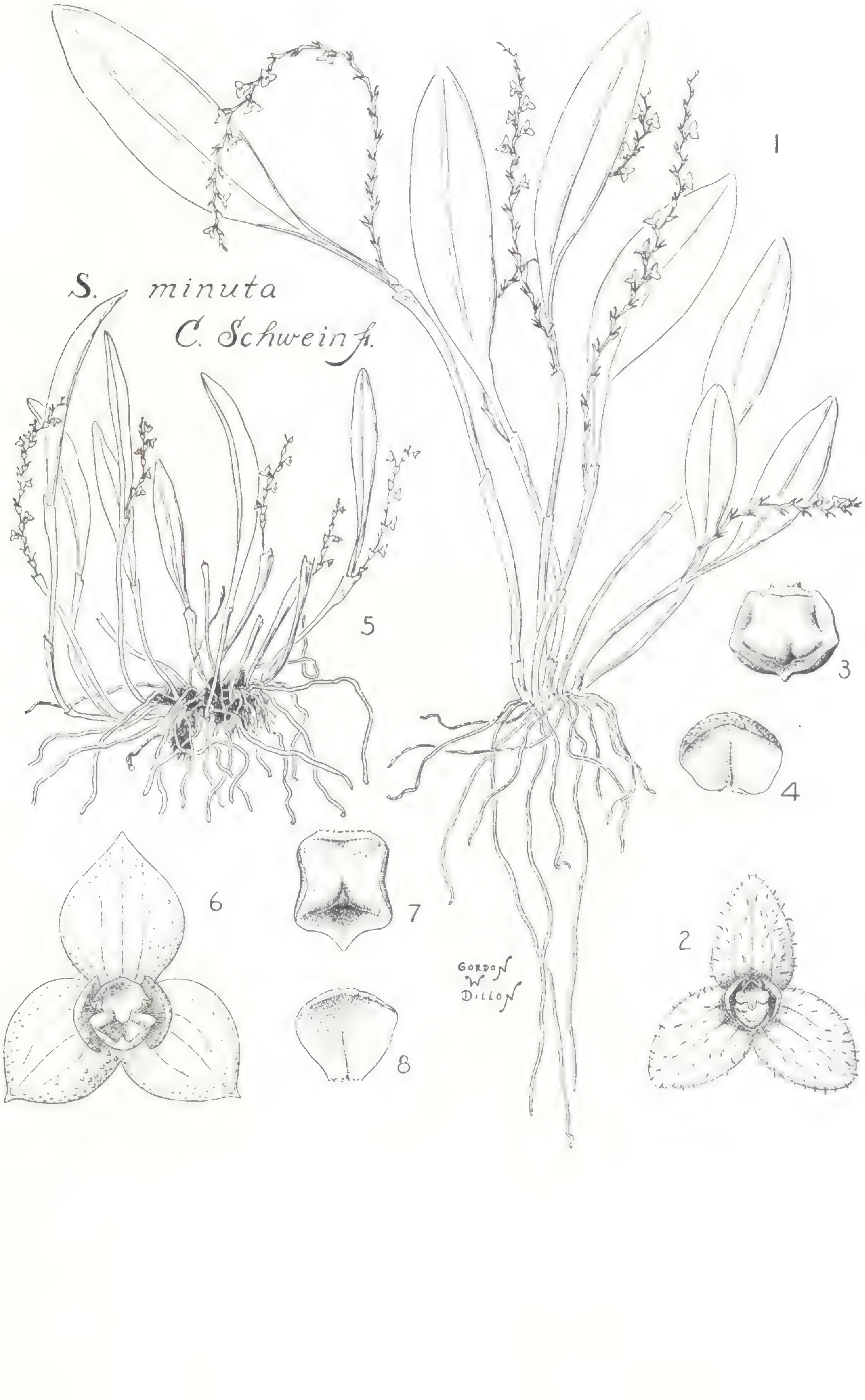


PLATE XV

LEPANTHES

caudatisepala

G. Schwein fl.

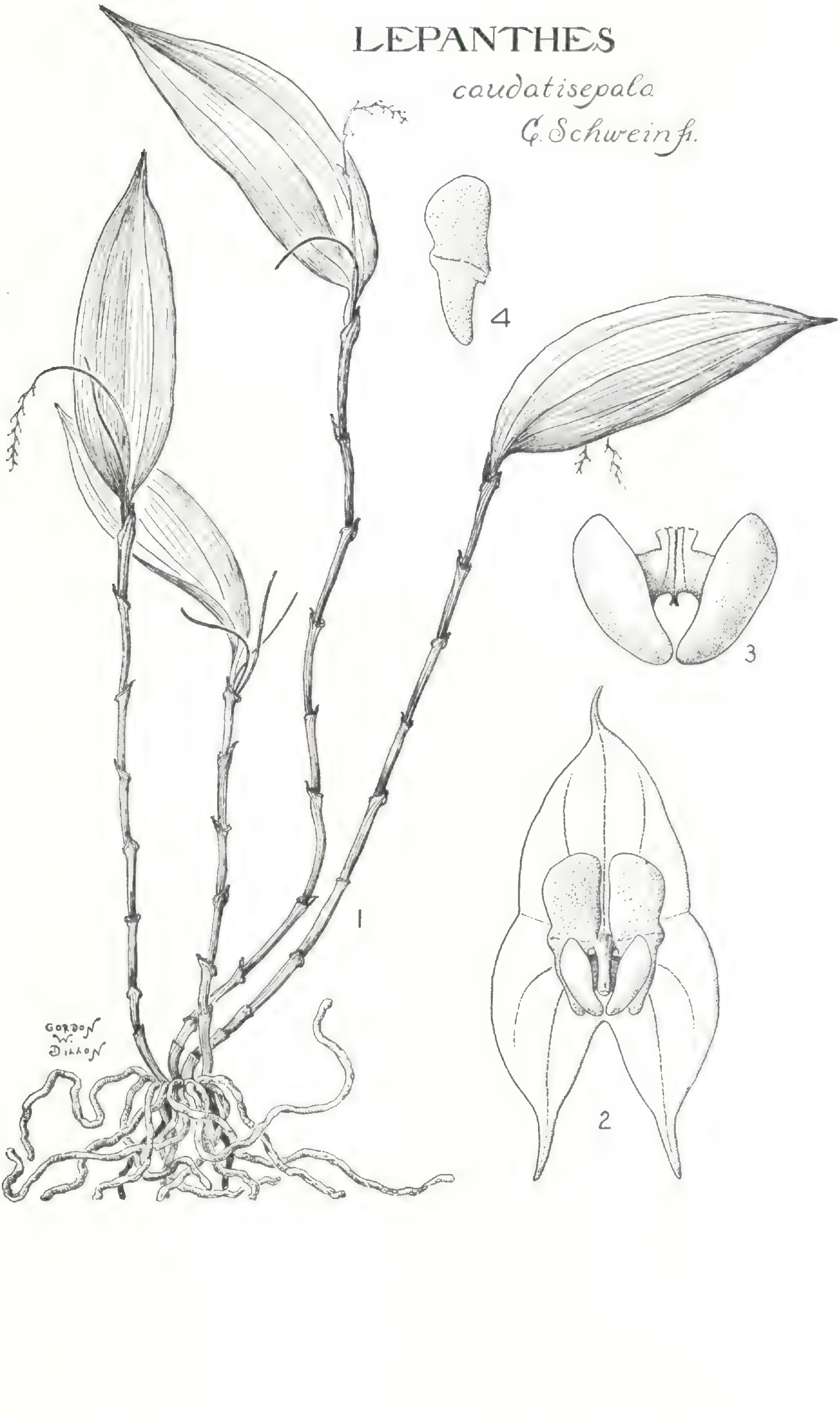
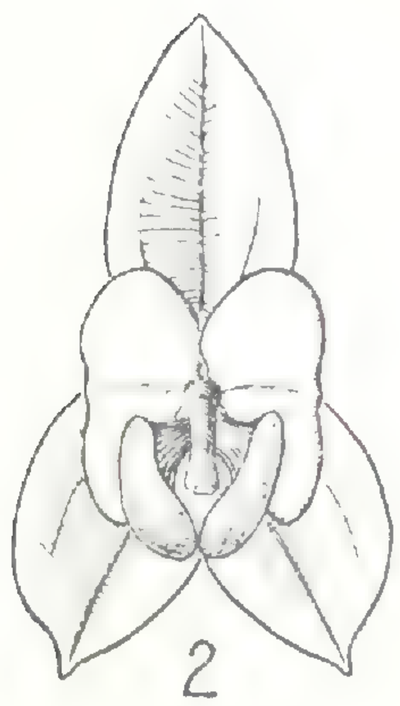


PLATE XVI

LEPANTHES

pumila

C. Schweinfs.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L. alticola C. Schweinfs.

NOMENCLATORIAL NOTES IN PLEUROTHALLIS

BY

CHARLES SCHWEINFURTH

Pleurothallis angustisegmenta *C. Schweinfurth nom. nov.*

Restrepia cucullata Lindley in Ann. & Mag. Nat. Hist. 15 (1845) 108; Fol. Orch. Restrepia (1859) p. 3, non *Pleurothallis cucullata* Ames (1923).

Restrepia rhynchantha Reichenbach filius & Warscewicz in Bonpl. 2 (1854) 114.

Barbosella cucullata Schlechter in Fedde Repert. 15 (1918) 261.

Barbosella rhynchantha Schlechter in Fedde Repert. 15 (1918) 263.

Pleurothallis rhynchantha L.O. Williams in Bot. Mus. Leafl. Harv. Univ. 7 (1939) 188.

In his Folia Orchidacea (l.c.), Lindley treated *Restrepia rhynchantha* as synonymous with *R. cucullata*; a conclusion which was formed after examining authentic material of *R. rhynchantha* sent to him by Reichenbach. The flower of the latter species appears to be somewhat larger than that of *R. cucullata*.

Since the genus Pleurothallis, which is now considered to include the concept Restrepia, already has a species named *P. cucullata*, the above new name is required.

Furthermore, it is clear that the genus Barbosella is untenable and is mostly, if not entirely, referable to Pleurothallis.

Pleurothallis caulescens *Lindl.* in Hooker Journ. Bot. 1 (1834) 9; Fol. Orch. Pleurothallis (1859) p. 44.

Humboldtia caulescens O. Kuntze Rev. Gen. Pl. 2 (1891) 667.

Pleurothallis graminea Schlechter in Fedde Repert. Beih. 9 (1921) 74: ex Mansf. in Beih. 57 (1929) t. 114, Nr. 447.

Judging from a photograph with floral analysis of typical *Pleurothallis caulescens* as compared with the description and a floral analysis of *P. graminea* (l.c.), these concepts are scarcely separable. This conclusion is strengthened by reference to collections from Ecuador, the locality of the type of *P. caulescens*. These show some stems and leaves whose measurements are as small as those specified for *P. graminea* and have flowers of apparently the same color as those of *P. caulescens*.

The flowers of *P. graminea* seem to be slightly smaller than those of *P. caulescens* and there are inconsequential differences in details of the floral segments.

It seems, therefore, to be advisable to follow Kränzlin in regarding *Weberbauer 758* (the type of *P. graminea*) as referable to *P. caulescens*.

HARVARD
MAY 22 1942

BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, MAY 22, 1942 VOL. 10, NO. 6

RECENT CHANGES IN THE NAMES OF ECONOMIC PLANTS

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WHILE engaged in checking the names of various economic plants in the last editions of the United States Pharmacopoeia, The National Formulary and the United States Dispensatory, and many of the names submitted for inclusion in the new edition of Standardized Plant Names, it became evident that in a considerable number of instances these names were incorrect under the present International Rules of Nomenclature.

Although in all instances the correct names of these species have been pointed out elsewhere, it has been suggested that it might be of service to botanists and pharmacologists who do not have access to all the taxonomic literature, to have certain of the changes brought again to their attention.

Accordingly the following list of economic species is presented, indicating in each case the correct name under the Rules, the essential synonymy, and brief discussions whenever necessary for complete clarity.

A few names which involve matters of a taxonomic rather than nomenclatorial nature are included in order to bring such names into accord with general botanical usage.

A supplementary list of changes which have previously

been discussed in these pages (7 (1939) 89-111) is also appended.

Achras Sapota L. See Achras Zapota *L.*

Achras Zapota auct., non L. See Calocarpum Sapota (*Jacq.*) *Merr.*

Achras Zapota *Linnaeus* Sp. Pl. (1753) 1190.

Sapota fructu ovato majori Plumier Nov. Pl. Am. (1703) 43, pl. 4.

Achras Sapota Linnaeus Sp. Pl., ed. 2 (1762) 470.

Sapota Achras Miller Gard. Dict., ed. 8 (1768) no. 1.

Cook (in Contrib. U.S. Nat. Herb. 16 (1913) 285) has pointed out that the Linnean genus *Achras* was based on Plumier's plate of *Sapota* which clearly illustrates the sapodilla. Furthermore, the first citation under *Achras Zapota*, the only species given in the first edition of the Species Plantarum, is to Plumier's *Sapota fructu ovato majori*, the form figured in the plate. It is evident that Linnaeus had the sapodilla in mind when he described *A. Zapota* and this name must be used for the species involved, no matter what its subsequent nomenclatorial history may have been.

Aechmea magdalenae (*André*) *André ex Baker* Handb. Bromel. (1889) 65.

Chevalliera Magdalenae André Enum. Bromel. (3 Dec. 1888) 3; and in Rev. Hort. 60 (16 Dec. 1888) 563.

Bromelia magdalenae C. H. Wright in Kew Bull. (1923) 267.

Ananas magdalenae Standley in Standley & Calderon Lista prelim. Pl. S. Salvador (1925) 45.

Aframomum Melegueta (*Rosc.*) *K. Schumann* in Engl. Pflanzenreich IV. 46 (Heft 20) (1904) 204.

Amomum Melegueta Roscoe Monandr. Pl. (1828) t. 28.

Alisma Plantago-aquatica auct. Am., non L. See Alisma subcordata *Raf.*

Alisma subcordata *Rafinesque* in Med. Repos. N.Y. 5 (1808) 362.

Alisma Plantago-aquatica auct. Am., non Linnaeus (1753).

Aloe barbadensis *Miller* Gard. Dict., ed. 8 (1768) no. 2.

Aloe perfoliata L. [var.] π. *vera* Linnaeus Sp. Pl. (1753) 320.

Aloe vera "L." auct. plur., non Miller (1768).

Aloe vulgaris Lamarck Encycl. 1 (1783) 86.

Aloe vera auct. See Aloe barbadensis *Mill.*

Aloe vulgaris Lam. See Aloe barbadensis *Mill.*

Amomum Melegueta Rosc. See Aframomum Melegueta (*Rosc.*) *K. Schum.*

Amygdalus communis L. See Prunus Amygdalus *Batsch*

Ananas magdalenae (André) Standl. See Aechmea magdalenae (*André*) *André ex Baker*

Andira Araroba *Aguiar* Mem. sobre a Araroba (1885) 31.

Vouacapoua Araroba Lyons Pl. Names Sci. & Pop. (1900) 31.

Vataireopsis Araroba Ducke in Ann. Acad. Bras. Sci. 8 (1936) 26.

Andira Lamarck (1783) has been conserved over *Vouacapoua* Aublet (1775). Recently Ducke has segregated *Andira Araroba* and described a new monotypic genus, *Vataireopsis*, to include it. This segregation may later prove to be acceptable to other botanists.

Aniba Coto (*Rusby*) *Kostermann* in Rec. Trav. Bot. Neérl. 35 (1938) 916.

Nectandra Coto Rusby in Bull. Torr. Bot. Club 69 (1922) 260.

Arisaema atrorubens (*Ait.*) *Blume* in Rumphia 1 (1835) 97.

Arum atrorubens Aiton Hort. Kew 3 (1789) 315.

Arum triphyllum atropurpurea Michaux Fl. Bor.-am. 2 (1803) 188.

Arisaema triphyllum auct. plur., non Schott (1832).

Fernald (in Rhodora 42 (1940) 247) has corrected a misinterpretation of long standing in regard to the Jack-in-the-Pulpits. The specimen on which Linnaeus based his *Arum triphyllum* is not the familiar plant which has been passing as *Arisaema triphyllum* (L.) Schott, but a form of *Arisaema pusillum* (Peck) Nash. The specific epithet *triphyllum* must be transferred to this latter plant; while for the former species the name *Arisaema atrorubens* (Ait.) Blume is adopted.

Arisaema triphyllum auct., non Schott. See Arisaema atrorubens (*Ait.*) *Blume*.

Armoracia lapathifolia *Gilibert* Fl. Lituan. 2 (1781) 53.

Cochlearia Armoracia Linnaeus Sp. Pl. (1753) 648.

Cochlearia rusticana Lamarck Fl. Fr. 2 (1778) 471. *nomen illegitimum.*

Armoracia rusticana Gaertner, Meyer & Scherbius Fl. Wetterau 2 (1800) 426.

Nasturtium Armoracia Fries Fl. Scan. (1835) 65.

Rorippa Armoracia Hitchcock Spring Fl. Manhattan [Kan.] (1894) 18, as *Roripa*.

Radicula Armoracia Robinson in Rhodora 10 (1908) 32.

If the genus *Armoracia* is segregated from *Rorippa*, as is generally the practice, the correct name for the horseradish becomes *A. lapathifolia* Gilib. The earliest specific epithet is not available under the tautonym rule. Lamarck's epithet is illegitimate since he cited but failed to use Linnaeus' earlier name. Such illegitimate names are not to be considered for purposes of priority.

Artabotrys odoratissimus (Roxb.) R. Br. See Artabotrys uncinatus (*Lam.*) *Merr.*

Artabotrys uncinatus (*Lam.*) *Merrill* in Philipp. Journ. Sci. Bot. 7 (1912) 234.

Anona uncinata Lamarck Encycl. 2 (1786) 127.

Uvaria odoratissima Roxburgh Hort. Beng. (1814) 43, *nomen nudum*; Fl. Ind., ed. 2, 2 (1832) 666.

Artabotrys odoratissimus R. Brown in Bot. Reg. 5 (1820) t. 423.

Artocarpus altilis (*Park.*) *Fosberg* in Journ. Washington Acad. Sci. 31 (1941) 95.

Sitodium altile Parkinson Journ. Voy. Endeavour (1773) 45.

Artocarpus communis Forster Char. Gen. Pl. (1776) 101.

Rademachia incisa Thunberg in Handl. K. Svensk. Vet. Akad. Stockholm 37 (1776) 253.

Artocarpus incisus Linnaeus filius Suppl. (1781) 411.

Artocarpus communis Forst. See Artocarpus altilis (*Park.*) *Fosb.*

Artocarpus integra (Thunb.) Merr. See Artocarpus heterophyllus *Lam.*

Artocarpus heterophyllus *Lamarck* Encycl. 3 (1789) 209, (as *heterophylla*).

Artocarpus integrifolius auct., non Linnaeus filius Suppl. (1781) 412.

Artocarpus integra sensu Merrill Interpret. Herb. Amboin. (1917) 190, *quoad nomen non quoad plantam.*

Corner (in Gard. Bull. Straits Settlements 10 (1939) 56) has shown that in the past the name of the Jak and Chempedak have been confused and misapplied. A study of the original description and type specimens of *Rademachia integra* Thunb. reveals the fact that they apply to the Chempedak of Malaya (which has been called *Artocarpus champeden* Spreng.) rather than to the Jak, a native of India. The combination *Artocarpus integra* (Thunb.) Merr., which has been used for the Jak, must henceforth be reserved for the Chempedak. The earliest available name for the Jak is *A. heterophyllus* Lam.

Asagraea officinalis (Schlecht. & Cham.) Lindl. See Schoenocaulon officinalis (*Schlecht. & Cham.*) *A. Gray ex Benth.*

Avicennia marina (*Forsk.*) *Vierhapper* in Denkschr. Kais. Akad. Wiss. Wien 71 (1907) 435.

Sceura marina Forskal Fl. Aegypt.-Arab. 2 (1775) 37.
Avicennia nitida Thunberg Fl. Ceil. (1825) 8, non Jacquin (1760).

Avicennia nitida Thunb. is an invalid name on three counts. It is a nomen nudum, a later homonym of *A. nitida* Jacquin (1760), and it ignores the priority rule, since *marina* is an earlier epithet.

Avicennia nitida Thunb. See Avicennia marina (*Forsk.*) *Vierh.*

Barringtonia asiatica (*L.*) *Kurz* in Prelim. Rept. Veg. Pegu (1875) App. A, 55; App. B, 72.

Mammea asiatica Linnaeus Sp. Pl. (1753) 512.
Barringtonia speciosa J. R. & G. Forster Char. Gen. Pl. (1776) 76, t. 38.

Barringtonia speciosa J. R. & G. Forst. See Barringtonia asiatica (*L.*) *Kurz*

Bassia latifolia Roxb. See Madhuca indica *Gmel.*

Betula alba L. See Betula pendula *Roth*

Betula pendula *Roth* Tent. Fl. Germ. 1 (1788) 405.
Betula alba Linnaeus Sp. Pl. (1753) 982, *pro parte* (*nomen ambiguum*).
Betula verrucosa Ehrhart Beitr. 6 (1791) 98.

Boldu Boldus (Mol.) Lyons. See Peumus Boldus *Mol.*

Bombax malabarica DC. See Salmalia malabarica (*DC.*) *Schott & Endl.*

Brassica alba (L.) Rabenh. See Brassica hirta *Moench*

Brassica arvensis (L.) Rabenh. See Brassica Kaber (*DC.*) *Wheeler*

Brassica hirta *Moench* Meth. Pl. Suppl. (1802) 84.
Sinapis alba Linnaeus Sp. Pl. (1753) 668.
Brassica alba Rabenhorst Fl. Lusat. 1 (1839) 184—Boissier Voy. Espagne 2 (1839-45) 39, non Gilibert (1781).

Brassica Kaber (*DC.*) *Wheeler* in Rhodora 40 (1938) 306.
Sinapis Kaber DeCandolle Syst. 2 (1821) 617.
Sinapis arvensis Linnaeus Sp. Pl. (1753) 668.
Brassica arvensis Rabenhorst Fl. Lusat. 1 (1839) 184, non Linnaeus (1767).

Bursera Aloëxylon (Schiede ex Schlecht.) Engl. See Bursera glabrifolia (*HBK.*) *Engl.*

Bursera Delpechianum Poiss. ex Engl. See Bursera penicillata (*Sessé & Moc. ex DC.*) Engl.

Bursera glabrifolia (*HBK.*) *Engler* in Engler & Prantl Nat. Pflanzenfam. 3, Abt. 4 (1896) 251, excl. synonymy.

Elaphrium glabrifolium Humboldt, Bonpland & Kunth Nov. Gen. et Sp. 7 (1825) 28.
Elaphrium Aloëxylon Schiede ex Schlechtendal in Linnaea 17 (1843) 252.
Bursera Aloëxylon Engler in Engler Bot. Jahrb. 1 (1881) 44.

Bursera penicillata (*Sessé & Moc. ex DC.*) *Engler* in Engler Bot. Jahrb. 1 (1881) 44.
Elaphrium penicillatum Sessé & Mocino ex DC. in DeCandolle Prodr. 1 (1824) 724.
Bursera Delpechiana Poisson ex Engler in DeCandolle Monogr. 4 (1833) 53.
Elaphrium Delpechianum Rose in N. Amer. Fl. 25 (1911) 253.

Brauneria *Necker* Elem. Bot. 1 (1790) 17.
Echinacea Moench Meth. Pl. (1794) 591.

Brauneria, which has priority over *Echinacea*, was discarded under the American Code because the description was not accompanied by a citation of species. No such provision applies under the International Rules and the earlier name can be maintained.

Calocarpum mammosa (L.) Pierre. See Calocarpum Sapota (*Jacq.*) *Merr.*

Calocarpum Sapota (*Jacq.*) *Merrill* in Enum. Philipp. Flow. Pl. 3 (1923) 284.
Sideroxylum Sapota Jacquin Enum. Pl. Carib. (1760) 15
Achras Zapota auct., non Linnaeus (1753).
Achras mammosa Linnaeus Sp. Pl., ed. 2 (1762) 469, excl. var.
Sapota mammosa Miller Gard. Dict., ed. 8 (1768) no. 2.
Lucuma mammosa Gaertner filius Fruct. et Semen. 3 (1807) 129, t. 203.

Calocarpum mammosum Pierre in Urban Symb. Antill. 5 (1904) 98.

Camellia sinensis (*L.*) *O. Kuntze* in Act. Hort. Petrop. 10 (1887) 195.

Thea sinensis Linnaeus Sp. Pl. (1753) 515.
Camellia Thea Link Enum. Pl. Hort. Berol. 2 (1822) 73.

Canthium dicoccum (*Gaertn.*) *Merrill* in Philipp. Journ. Sci. 35 (1928) 8.

Psydrax dicoccus Gaertner Fruct. et Semen. 1 (1788) 125, t. 26.
Canthium didymum Gaertner filius Fruct. et Semen. 3 (1805) 94.
Plectronia didyma Elmer Leafl. Philipp. Bot. 1 (1906) 28.
Plectronia dicocca Merrill in Enum. Philipp. Flow. Pl. 3 (1923) 536.

Canthium didymum Gaertn.f. See Canthium dicoccum (*Gaertn.*) *Merr.*

Carallia brachiata (*Lour.*) *Merrill* in Philipp. Journ. Sci. 15 (1919) 249.

Diatoma brachiata Loureiro Fl. Cochinch. (1790) 296.
Carallia integerrima A. P. de Candolle in De Candolle Prodr. 3 (1828) 33.

Carallia integerrima A. P. DC. See Carallia brachiata (*Lour.*) *Merr.*

Caryophyllus aromatica L. See Eugenia caryophyllata *Thunb.*

Casearia praecox Griseb. See Gossypiospermum praecox (*Griseb.*) *P. Wils.*

Cassia acutifolia *Delile* Fl. Aegypt. (1813) 75, t. 27, f. 1.

Cassia Senna Linnaeus Sp. Pl. (1753) 377, *pro parte*, (*nomen ambiguum*).

Cassia fistula *Linnaeus* Sp. Pl. (1753) 377.

Cathartocarpus Fistula Persoon Syn. Pl. 1 (1805) 459.

Cassia Senna L. See Cassia acutifolia *Del.*

Cathartocarpus Fistula (L.) Pers. See Cassia fistula *L.*

Chrysanthemum coccineum *Willdenow* Sp. Pl. 3 (1804) 2144.

Chrysanthemum roseum Adam in Weber & Mohr Beitr. 1 (1805) 70.

Pyrethrum roseum Bieberstein Fl. Taur. Cauc. 2 (1808) 1324.

Chrysanthemum roseum Adam. See Chrysanthemum coccineum *Willd.*

Citrus Aurantium L. var. *sinensis* L. See Citrus sinensis (*L.*) *Osbeck*

Citrus Limon (*L.*) *Burmann filius* Fl. Ind. (1768) 173.

Citrus Medica Linnaeus β. *Limon* Linnaeus Sp. Pl. (1753) 782.

Limon vulgaris Miller Gard. Dict., ed. 8 (1768) no. 1.

Citrus Limonum Risso in Ann. Mus. Paris 20 (1813) 201; and in Nouv. Duhamel 7 (1816) 77, t. 28.

Citrus Limonia auct., non Osbeck (1765).

Citrus Medica L. var. *Limon* L. See Citrus Limon (*L.*) *Burm.f.*

Citrus sinensis (*L.*) *Osbeck* Dagbok Ostind. Resa (1757) 41, *nomen nudum*; Reise Ostind. & China (1765) 250.

Citrus Aurantium Linnaeus β. *sinensis* Linnaeus Sp. Pl. (1753) 783.

Cochlospermum Gossypium DC. See Cochlospermum religiosum (*L.*) *Alston*

Cochlospermum religiosum (*L.*) *Alston* in Trimen Handb. Fl. Ceylon 6 (1931) 14.

Bombax religiosa Linnaeus Sp. Pl. (1753) 512.

Bombax Gossypium Linnaeus Syst. Nat., ed. 12 (1767) 457.

Cochlospermum Gossypium De Candolle Prodr. 1 (1824) 527.

Cola acuminata auct., non Schott & Endlicher. See Cola nitida (*Vent.*) *A. Chev.*

Cola nitida (*Vent.*) *A. Chevalier* Veg. Util. Afr. Trop. Fr. 6 (1911) 120.

Sterculia nitida Ventenat Jard. Malmaison (1804) sub t. 91.

Cola acuminata auct. plur., non Schott & Endlicher (1832).

Cola vera K. Schumann in Engler Monogr. Afr. Pfl. Fam. 5 (1900) 110.

Chevalier has shown that the source of the best cola nuts of commerce is *Cola nitida* (Vent.) A. Chev., a native of the Ivory Coast and Liberia now widely cultivated from Sierra Leone to the Gaboon. This species has been passing in the literature as *Cola acuminata* (Beauv.) Schott & Endl. The true *C. acuminata* is a different species, more widely distributed in tropical West Africa, but yielding inferior nuts.

Copaiba auct. See Copaifera *L.*

Copaifera *Linnaeus* Sp. Pl., ed. 2 (1762) 557.

Copaiva Jacquin Enum. Pl. Carib. (1760) 4 (*Copaiba* auct.).

Copaifera Linnaeus (1762) has been conserved over *Copaiva* Jacquin (1760), [*Copaiba* of authors].

Copaifera conjugata (*Bolle*) *Milne-Redhead* in Kew Bull. (1934) 400.

Gorskia conjugata Bolle in Peters Reise Mossamb. Bot. 1 (1861) 16, t. 3.

Copaifera Gorskiana Bentham in Trans. Linn. Soc. 25 (1865) 317.

Copaiba conjugata O. Kuntze Rev. Gen. Pl. 1 (1891) 172.

Copaifera copallifera (*Benn.*) *Milne-Redhead* in Kew Bull. (1934) 400.

Guibourtia copallifera Bennett in Journ. Linn. Soc. 1 (1857) 150.

Copaifera Guibourtiana Bentham in Trans. Linn. Soc. 25 (1865) 317.

Copaifera copallina Baillon Hist. Pl. 2 (1870) 142,163.

Copaiba copallifera O. Kuntze Rev. Gen. Pl. 1 (1891) 172.

Copaifera Gorskiana Benth. See Copaifera conjugata (*Bolle*) *Milne-Redhead*

Copaifera Guibourtiana Benth. See Copaifera copallifera (*Benn.*) *Milne-Redhead*

Coptis groenlandica (*Oeder*) *Fernald* in Rhodora 31 (1929) 142.

Anemone groenlandica Oeder Fl. Dan. 4, fasc. 10 (1770) 5, t. 566.

Helleborus trifolius Linnaeus Sp. Pl., ed. 2 (1762) 784, as to Canadian plant only.

Coptis trifolia Salisbury in Trans. Linn. Soc. 8 (1807) 305, *pro parte*.

Fernald (in Rhodora 31 (1929) 136) has shown that there are two species of *Coptis* in North America, which have been passing as *Coptis trifolia* (L.) Salisb. : an Alaskan species found also in northeastern Asia, and the common plant of northeastern America and Greenland. The specific name *C. trifolia* (L.) Salisb. belongs to the Alaskan plant, and not to the northeastern species, the source of commercial gold-thread. The correct name of this latter plant is *C. groenlandica* (Oeder) Fernald.

Coptis trifolia auct., non Salisb. See Coptis groenlandica (*Oeder*) *Fern.*

Coumarouna Aublet. See Dipteryx *Schreber.*

Cybistax Donnell-Smithii (*Rose*) *Seibert* in Carn. Inst. Publ. 522 [Bot. Maya Area XXI] (1940) 392.
Tabebuia Donnell-Smithii Rose in Bot. Gaz. 17 (1892) 418, pl. 26.

Cydonia oblonga *Miller* Gard. Dict., ed. 8 (1768) no. 1.
Pyrus Cydonia Linnaeus Sp. Pl. (1753) 480.
Cydonia vulgaris Persoon Syn. Pl. 2 (1807) 40, 658.

Cydonia vulgaris Pers. See Cydonia oblonga *Mill.*

Cypripedium bulbosum Mill. See Cypripedium Calceolus *L.*, var. pubescens (*Willd.*) *Correll.*

Cypripedium Calceolus *L.*, var. **pubescens** (*Willd.*) *Correll* in Bot. Mus. Leafl. Harvard Univ. 7 (1938) 14.
Cypripedium Calceolus Linnaeus Sp. Pl. (1753) 951, *pro parte.*
Cypripedium bulbosum Miller Gard. Dict., ed. 8 (1768) no. 3.
Cypripedium parviflorum Salisbury in Trans. Linn. Soc. 1 (1791) 77, t. 2, f. 2.

Cypripedium pubescens Willdenow Hort. Berol. 1 (1809) 947.
Cypripedium parviflorum Salisb. var. *pubescens* (Willd.) Knight in Rhodora 8 (1906) 93.

Cypripedium parviflorum Salisb. See Cypripedium Calceolus *L.* var. pubescens (*Willd.*) *Correll*

Cypripedium parviflorum Salisb. var. *pubescens* (Willd.) Knight. See Cypripedium Calceolus *L.* var. pubescens (*Willd.*) *Correll*

Dipteryx *Schreber* Gen. Pl., ed. 8 (1791) 485.
Coumarouna Aublet Pl. Guian. 2 (1775) 740, t. 296.
Dipterya Schreber (1791) has been conserved over *Coumarouna* Aublet (1775).

Echinacea Moench. See Brauneria *Necker*

Echinocactus Williamsii Lem. See Lophophora Williamsii (*Lem.*) *Coult.*

Echinocystis fabacea *Naudin* in Ann. Sci. Nat., ser. 4, 12 (1859) 154, t. 9.
Megarrhiza californica Torrey in Torrey & Gray Pacific R. R. Rept. 6 (1857) 74, *nomen tantum*: 12, pt. 2 (1861) 61.
Micrampelis fabacea Greene in Pittonia 2 (1890) 129.
Marah fabacea Greene in Leafl. Bot. Obs. 2 (1910) 36.

Entada phaseoloides (*L.*) *Merrill* in Philipp. Journ. Sci. Bot. 9 (1914) 86.
Lens phaseoloides Linnaeus in Stickman Herb. Amb. (1754) 18; Amoen. Acad. 4 (1759) 128.
Mimosa scandens Linnaeus Sp. Pl., ed. 2 (1763) 1501.
Entada scandens Bentham in Hooker London Journ. Bot. 4 (1842) 332.

Entada scandens (L.) Benth. See Entada phaseoloides (*L.*) *Merr.*

Erythroxylon *Linnaeus* Syst. Nat., ed. 10 (1759) 1035.

Erythroxylum P. Browne Civ. & Nat. Hist. Jamaica (1756) 278, *nomen nudum.*

Although Patrick Browne first used the name *Erythroxylum* he gave no generic description, merely describing the two species comprising the genus. If the genus had been monotypic the specific description could be considered as constituting the generic description as well, thus validating the publication of the name. As it stands, however, *Erythroxylum* P. Br. is not validly published under the Rules and must be discarded in favor of *Erythroxylon* L., the next older name.

Erythroxylum P. Browne. See Erythroxylon L.

Eucalyptus camaldulensis *Dehnhardt* Cat. Pl. Hort. Camald., ed. 2 (1832) 20.

Eucalyptus rostrata Schlechtendal in Linnaea 20 (1847) 655, non Cavanilles (1797).

Eucalyptus longirostris F. v. Mueller ex Miquel in Nederl. Kruidk. Arch. 4 (1859) 125.

Eucalyptus rostrata Schlecht. See Eucalyptus camaldulensis *Dehnh.*

Eucarya spicata (*R. Br.*) *Sprague & Summerhays* in Kew Bull. (1927) 196.

Fusanus spicatus R. Brown Prodr. Fl. Nov. Holl. (1810) 355.

Santalum spicatum A. DeCandolle in DeCandolle Prodr. 14 (1857) 685.

Sprague & Summerhays point out (in Kew Bull. (1917) 195) that the generic name *Fusanus* cannot be main-

tained under the Rules for the Australian and New Zealand species formerly included in it. *Fusanus*, as originally established by Murray, applied to a South African species (later referred to *Colpoon*), and its use must be restricted to this, its original sense. The name (following Robert Brown) cannot be extended to include the Australian and New Zealand species now recognized as constituting a distinct genus. The earliest available name for this genus is *Eucarya* T. L. Mitchell.

Eugenia aromatica (L.) Baill. See Eugenia caryophyllata *Thunb.*

Eugenia caryophyllata *Thunberg* Diss. de Caryoph. arom. (1788) 1.

Caryophyllus aromatica Linnaeus Sp. Pl. (1753) 515.
Myrtus Caryophyllus Sprengel Syst. Veg. 2 (1825) 485.
Eugenia aromatica Baillon Hist. Pl. 6 (1877) 311, 345, non Berg (1854).
Jambosa Caryophyllus Niedenzu in Engler & Prantl Pflanzenfam. 3, Abt. 7 (1893) 85.
Syzygium aromaticum Merrill & Perry in Mem. Gray Herb. 4 (1939) 196.

If the Clove is maintained in the genus *Eugenia* the combination *E. aromatica* Baillon (1877) must be discarded, since it is a later homonym of *E. aromatica* Berg (1854); and *E. caryophyllata* substituted in its place. If the genus *Syzygium* is accepted, as circumscribed by Merrill and Perry, the correct name is *S. aromaticum* (L.) Merr. & Perry.

Exogonium Jalapa (Nutt. & Coxe) Baill. See Exogonium purga (*Wend.*) *Benth.*

Exogonium purga (*Wend.*) *Bentham* Pl. Hartweg. (1839) 46.

Convolvulus purga Wenderoth in Pharm. Centralbl. 1 (1830) 457.
Ipomoea Jalapa Nuttall & Coxe in Am. Journ. Med. Sci. 5 (1829) [1830] 300, non Pursh (1814).
Ipomoea purga Hayne Arzneigewächse 12 (1833) 33, 34.
Exogonium Jalapa Baillon in Compte Rendu Assoc. Fr. Avanc. Sci. (1873) 455.

Fagopyrum esculentum Moench. See Fagopyrum sagittatum *Gilib.*

Fagopyrum sagittatum *Gilibert* Exercit. Phyt. 2 (1792) 435.

Fagopyrum esculentum Moench Meth. Pl. (1794) 290.

Feronia elephantum Corr. See Limonia acidissima *L.*

Feronia Limonia (L.) Swingle. See Limonia acidissima *L.*

Flacourtia cataphracta Roxb. See Flacourtia jangomas (*Lour.*) *Raeusch.*

Flacourtia jangomas (*Lour.*) *Raeuschel* Nomencl. Bot. (1797) 290.

Stigmarota jangomas Loureiro Fl. Cochinch. (1790) 634.
Flacourtia catophracta Roxburgh ex Willdenow Sp. Pl. 4 (1806) 830.

Furcraea cubensis (Jacq.) Vent. See Furcraea hexapetala (*Jacq.*) *Urb.*

Furcraea hexapetala (*Jacq.*) *Urban* Symb. Ant. 4 (1903) 152 (as *Furcroya*).

Agave hexapetala Jacquin Enum. Pl. Carib. (1760) 18.
Agave cubensis Jacquin Sel. Stirp. Am. (1763) 100.

Furcraea cubensis Ventenat in Bull. Soc. Philomat. 1 (1793) 66.

Fusanus spicatus R. Br. See Eucarya spicata (*R. Br.*) *Sprague & Summerhayes*

Gossampinus heptaphylla (Houtt.) Bakh. See Salmalia malabarica (*DC.*) *Schott & Endl.*

Gossypiospermum praecox (*Griseb.*) *P. Wilson* in Torreya 30 (1930) 72.

Casearia praecox Grisebach Cat. Pl. Cub. (1866) 10.

Grindelia cuneifolia auct. Am., non Nutt. See Grindelia humilis *Hook. & Arn.*

Grindelia humilis *Hooker & Arnott* Bot. Beechey Voy. (1833) 147.

Grindelia cuneifolia auct. Am., non Nuttall (1841).

Steyermark, who has monographed the genus *Grindelia*, has shown (in Ann. Missouri Bot. Gard. 21 (1934) 524-528) that the species which has been passing as *G. cuneifolia* is in reality *G. humilis*.

Illipe latifolia (Roxb.) F. v. Muell. See Madhuca indica *Gmel.*

Iris caroliniana S. Wats. See Iris virginica *L.*

Iris virginica *Linnaeus* Sp. Pl. (1753) 39.

Iris caroliniana S. Watson in Gray Man. Bot. No. U.S., ed. 6 (1890) 514.

Lavandula officinalis *Chaix* in Villars Hist. Pl. Dauph. 1 (1786) 355.

Lavandula Spica Linnaeus Sp. Pl. (1753) 572, *pro parte* (*nomen ambiguum*).

Lavandula vera DeCandolle Fl. Fr. Suppl. 6 (1815) 398.

Lavandula Spica L. See Lavandula officinalis *Chaix*

Lens culinaris *Medikus* in Vorles. Kurpf. Phys.-oekon. Ges. 2 (1787) 361 (as *culinare*).

Ervum Lens Linnaeus Sp. Pl. (1753) 738.
Lens esculenta Moench Meth. Pl. (1794) 131.

Lens esculenta Moench. See Lens culinaris *Medik.*

Leontodon Taraxacum L. See Taraxacum officinale *Weber ex Wiggers*

Limonia acidissima *Linnaeus* Sp. Pl., ed. 2 (1762) 554.

Schinus Limonia Linnaeus Sp. Pl. (1753) 389.
Feronia elephantum Correa in Trans. Linn. Soc. 5 (1800) 225.
Feronia Limonia Swingle in Journ. Washington Acad. Sci. 4 (1914) 328.

Swingle (in Journ. Washington Acad. Sci. 4 (1914) 328) took up the generic name *Feronia* Correa for the wood-apple in the belief that *Limonia* and *Limonium* were orthographic variants of the same name, and consequently *Limonia* must be discarded as a later homonym.

Airy-Shaw (in Kew. Bull. (1939) 293) argues that under the present interpretation of the Rules the two names are distinct, and he reverts to the original Linnaean name for this species.

Recently, further clarification of the situation has resulted from the publication of a statement by the Special Committee on Nomenclature (in Kew. Bull. (1940) 83) in connection with a discussion of new nomina conservanda. This statement is to the effect that "generic names ending in masculine, feminine and neuter terminations, -us, -a, -um, are held to be different."

It seems clear, therefore, that *Limonia acidissima* L. must be considered the correct name for the wood-apple.

Lophophora Williamsii (*Lem.*) *Coulter* in Contrib. U.S. Nat. Herb. 3 (1894) 131.

Echinocactus Williamsii Lemaire ex Salm-Dyck in Allg. Gartenz. 13 (1845) 385.

Anhalonium Williamsii Lemaire in Förster Handb. Cact. (1846) 233.

Lucuma mammosa (L.) Gaertn.f. See Calocarpum Sapota (*Jacq.*) *Merr.*

Madhuca indica *Gmelin* Syst. Nat. 2 (1791) 799.

Bassia latifolia Roxburgh Pl. Corom. 1 (1759) 20, t. 19.

Illipe latifolia F. v. Mueller Select. Extra-trop. Pl., ed. Am. (1884) 181.

Madhuca latifolia Macbride in Contrib. Gray Herb. 53 (1918) 18.

Since *Bassia* Koenig (1771) is a later homonym of *Bassia* Allioni (1766), it has been necessary to take up the generic name *Madhuca* Gmelin. Macbride, who made many of the new combinations required (in Contrib. Gray Herb. 53 (1918) 18), assigned *M. indica* Gmel. to synonymy under *M. longifolia*, an earlier epithet.

An examination of the descriptions and figures cited by Gmelin, however, shows that the Gmelin species is the equivalent of *M. latifolia* and not of *M. longifolia*. The Gmelin epithet, *indica*, has priority over *latifolia*.

Madhuca latifolia (Roxb.) Macbr. See Madhuca indica *Gmel.*

Majorana hortensis *Moench* Meth. Pl. (1794) 406.

Origanum Majorana Linnaeus Sp. Pl. (1753) 590.

Malva neglecta *Wallroth* Syll. Pl. Ratisb. 1 (1824) 140.

Malva rotundifolia auct., non Linnaeus (1753).

Morton has pointed out (in Rhodora 39 (1937) 98) that Linnaeus confused two species, the small-flowered *Malva pusilla* and the large-flowered *M. rotundifolia*, under his *Malva rotundifolia*. The plant Linnaeus apparently had in mind, which is represented by a specimen in his herbarium, is the small-flowered species which has been passing as *M. pusilla*, but which now must bear the name *M. rotundifolia*. The larger-flowered species, commonly known as Cheeses, becomes *M. neglecta*.

Malva rotundifolia auct., non L. See Malva neglecta *Wallr.*

Manilkara Kauki (*L.*) *Dubard* in Ann. Mus. Colon. Marseille, ser. 3, 3 (1915) 9.

Mimusops Kauki Linnaeus Sp. Pl. (1753) 349.

Megarrhiza californica Torr. See Echinocystis fabacea *Naud.*

Micrampelis fabacea (Naud.) Greene. See Echinocystis fabacea *Naud.*

Mimusops Kauki L. See Manilkara Kauki (*L.*) *Dubard*

Mucuna pruriens auct., non DC. See Mucuna pruritum *Wight*

Mucuna pruritum *Wight* in Hooker Bot. Misc. 2 (1831) 348.

Stizolobium pruritum Piper in Proc. Biol. Soc. Washington 30 (1917) 54.

Stizolobium pruriens auct., non Medikus (1787).

Mucuna pruriens auct., non DeCandolle (1825).

Piper has shown that *Dolichos pruriens* L., upon which *Stizolobium pruriens* Medik., and *Mucuna pruriens* DC. were based, applies to a Philippine and East Indian species, distinct from the cowage of India, now widespread in the tropics. This latter species is *Mucuna pruritum*

Wight, or *Stizolobium pruritum* (Wight) Piper in case the genus *Stizolobium* is segregated from *Mucuna*.

Myroxylon Pereirae *Klotzsch* in Bonplandia 5 (1857) 274.

Toluifera Pereirae Baillon Hist. Pl. 2 (1869) 383.

Myroxylon Linnaeus filius (1781) has been conserved over *Toluifera* Linnaeus (1753).

Nauclea auct., non L. See Neonauclea *Merr.*

Nauclea esculenta (*Afzel.*) *Merrill* in Journ. Washington Acad. Sci. 5 (1915) 535.

Sarcocephalus esculenta Afzelius ex R. Brown in Tuckey's Congo App. (1818) 467.

The original description of *Nauclea* L. was based on a species now considered generically distinct from those which have long borne this name. Under the International Rules a generic name must be used in its original sense; consequently *Nauclea* must be used for the genus which has been passing as *Sarcocephalus*, and a new name (*Neonauclea*) substituted for *Nauclea* as it has been known in the past.

Nectandra Coto Rusby. See Aniba Coto (*Rusby*) *Kosterm.*

Neonauclea *Merrill* in Journ. Washington Acad. Sci. 5 (1915) 538.

Nauclea auct., non Linnaeus (1762).

Since it is necessary under the Rules to transfer the species described under *Sarcocephalus* to *Nauclea*, a new generic name must be found to designate the species described under *Nauclea* by authors since Linnaeus. No earlier published name is available so *Neonauclea* must be adopted.

Origanum Majorana L. See Majorana hortensis *Moench*

Ourouparia Gambir (Hunt.) Baill. See Uncaria Gambir (*Hunt.*) *Roxb.*

Panax Ginseng (C. A. Mey.) Baill. See Panax Schinseng *Nees*

Panax Schinseng *Nees* Ic. Pl. Med. Suppl. (1833) no. 70.

Panax Ginseng C. A. Meyer in Bull. Phys.-Math. Acad. St. Petersburg 1 (1843) 340.

Aralia Ginseng Baillon Hist. Pl. 7 (1880) 197.

Paratecoma Peroba (*Record*) *Kuhlmann* in Minist. Agric. Serv. Fl. Bras. Bol. no. 4 (1931) 3, *in nota.*

Tecoma Peroba Record in Record & Mell Timbers Trop. Am. (1924) 537.

Petroselinum crispum (*Mill.*) *Nyman* ex Kew Hand-List Herb. Pl., ed. 3 (1925) 122.

Apium Petroselinum Linnaeus Sp. Pl. (1753) 264.

Apium crispum Miller Gard. Dict., ed. 8 (1768) no. 2.

Apium latifolium Miller Gard. Dict., ed. 8 (1768) no. 3.

Petroselinum hortense Hoffman Gen. Pl. Umbell. (1814) 163, 166.

Petroselinum sativum Hoffman Gen. Pl. Umbell. (1814) 177 (*in indice*).

Petroselinum hortense Hoffm. See Petroselinum crispum (*Mill.*) *Nym.*

Petroselinum sativum Hoffm. See Petroselinum crispum (*Mill.*) *Nym.*

Peumus Boldus *Molina* Sagg. Chil. (1782) 185.

Ruizia fragrans Ruiz & Pavon Syst. Veg. Fl. Peruv. et Chil. (1798) 267.

Boldu Boldus Lyons Pl. Names Sci. & Pop. (1900) 65.

Boldea Boldus Looser in Rev. Univ. Chili 20 (1935) 572.

The Special Committee for Phanerogamae and Pteridophyta appointed by the International Botanical Congress at Amsterdam has recently published (in Kew Bull. (1940) 81) a list of additional Nomina Generica Conservanda. In connection with this list it is stated (p. 82, 101) that the Committee recommends the conservation of *Peumus* Mol. (1782), with *P. Boldus* Mol. as lectotype, over *Boldu* Feuillée ex Adanson (1763).

Looser (in Lilloa 5 (1940) 167), however, publishes a letter from the Special Committee in which the statement is made that the Committee has "now decided to conserve *Cryptocarya* R. Br. (1810) over *Peumus* Molina (1782). Acting on this information Looser again calls attention to what he considers the correct name for the Boldu, *Boldea Boldus* (Mol.) Looser, presenting additional evidence and amplifying his reasons for discarding the earlier generic names *Ruizia* and *Boldu*.

In view of the disparity between the two statements of the Committee, it seems preferable to follow the official statement published in the Kew Bulletin, until the matter can be cleared up, and recognize *Peumus Boldus* Mol. as the correct name for the species involved.

Pimenta acris (Sw.) Kostel. See Pimenta racemosa (*Mill.*) *J. W. Moore*

Pimenta racemosa (*Mill.*) *J. W. Moore* in Bernice P. Bishop Mus. Bull. 102 (1933) 33.

Caryophyllus racemosus Miller Gard. Dict., ed. 8 (1768) no. 5.

Myrtus caryophyllata Jacquin Obs. Bot. 2 (1767) 1, non Linnaeus (1753).

Myrtus acris Swartz Prodr. Fl. Ind. Occ. 2 (1788) 909, excl. var. β.

Pimenta acris Kosteletsky All. Med. Pharm. Fl. 4 (1835) 1526.

Amomis acris Berg Handb. Pharm. Bot., ed. 3, 3 (1855) 339.
Amomis caryophyllata Krug & Urban in Engler Bot. Jahrb. 19 (1894) 573.

Pinus montana Mill. See Pinus Mugo *Turra*

Pinus Mugo Turra in Giorn. d'Ital. spelt. alle. Sc. Nat. 1 (1765) 152; Fl. Ital. Prodr. (1780) 67.
Pinus montana Miller Gard. Dict., ed. 8 (1768) no. 5.
Pinus Mughus Scopoli Fl. Carn., ed. 2, 2 (1772) 247.

Piper officinarum (Miq.) C.DC. See Piper retrofractum *Vahl*

Piper retrofractum *Vahl* Enum. Pl. 1 (1804) 314.
Piper officinarum C. DeCandolle in DeCandolle Prodr. 16 (1869) 356.

Plantago arenaria Waldt. & Kit. See Plantago indica *L.*

Plantago indica *Linnaeus* Syst. Nat., ed. 10, 2 (1759) 896.
Psyllium ramosum Gilibert Fl. Lituan. 1 (1781) 17.
Plantago arenaria Waldstein & Kitaibl Pl. Rar. Hung. 1 (1802) 51.
Plantago ramosa Ascherson Fl. Brandenb. (1864) 547.

Populus balsamifera L. See Populus Tacamahacca *Mill.*

Populus Tacamahacca *Miller* Gard. Dict., ed. 8 (1768) no. 6.
Populus balsamifera Linnaeus Sp. Pl. (1753) 1024, *pro parte* (*nomen ambiguum*).

Potentilla erecta (*L.*) *Raeuschel* Nomencl. Bot. (1797) 152.
Tormentilla erecta Linnaeus Sp. Pl. (1753) 500.

Fragaria Tormentilla Crantz Stirp. Aust., fasc. 1 (1763) 80.
Potentilla Tormentilla Necker Hist. Comm. Acad. Palat. 2 (1770) 491.

Potentilla Tormentilla (Crantz) Neck. See Potentilla erecta (*L.*) *Raeusch.*

Premna arborea (Forst.f.) Farwell. See Premna taitensis *Schau.*

Premna taitensis *Schauer* in DeCandolle Prodr. 11 (1847) 638, emend. F. Brown in Bernice P. Bishop Mus. Bull. 130, 3 (1935) 248 (as *tahitensis*).
Scrophularia arborea Forster filius Prodr. (1786) 91, no. 528.
Premna arborea Farwell in Druggist's Circ. 63 (1919) 50, non Roth (1821).

Prunus Amygdalus *Batsch* Beitr. Gesch. Natur. Reiche (1801) 30—*Stokes* Bot. Mat. Med. 3 (1812) 101.
Amygdalus communis Linnaeus Sp. Pl. (1753) 473.
Prunus communis Archangeli Comp. Fl. Ital. (1882) 209, non Hudson (1778).

Ribes Grossularia L. See Ribes Uva-crispa *L.*

Ribes Uva-crispa *Linnaeus* Sp. Pl. (1753) 201.
Ribes Grossularia Linnaeus Sp. Pl. (1753) 201.
Lamarck (Encycl. 3 (1789) 50) was the first to unite these two Linnean species and the name which he adopted must be used, under the Rules.

Rorippa Armoracia (L.) Hitchc. See Armoracia lapathifolia *Gilib.*

Rourea glabra *Humboldt, Bompland & Kunth* Nov. Gen. et Sp. 7 (1825) 41.

Rourea oblongifolia Hooker & Arnott Bot. Beechey's Voy. (1836) 283.

Rourea oblongifolia Hook. & Arn. See Rourea glabra *HBK.*

Sabadilla officinalis (Schlecht. & Cham.) Standley. See Schoenocaulon officinalis (*Schlecht. & Cham.*) *A. Gray ex Benth.*

Salmalia malabarica (*DC.*) *Schott & Endlicher* Meletem. Bot. (1832) 35.

Bombax malabarica DeCandolle Prodr. 1 (1824) 479.

Bombax Ceiba Linnaeus Sp. Pl. (1753) 511, *pro parte.*

Bombax heptaphyllum Houttuyn Nat. Hist. 3 (1774) 153, non Linnaeus (1753).

Gossampinus heptaphylla Bakhuisen in Ann. Jard. Buitenzorg, ser. 3, 6 (1924) 189.

Gossampinus malabarica Merrill in Lingnan Sci. Journ. 5 (1927) 126.

Furtado (in Gard. Bull. Straits Settlements 10 (1939) 173) has discussed at length the typification of *Bombax*, *Gossampinus* and *Salmalia*, and concludes that *Salmalia malabarica* (DC.) Schott & Endl. is the correct name for the Red Silk Cotton.

Two of the three species of *Bombax* enumerated in the Species Plantarum have since been transferred to other genera leaving only *B. Ceiba* available for purposes of typification. This Linnean species, however, comprised both American and Asiatic elements, a fact which has led to considerable variance in the application of the name.

Furtado follows both Schott & Endlicher (Meletem. Bot. (1832) 35) and Bakhuisen van den Brink (in Bull. Jard. Buitenzorg, ser. 3, 6 (1924) 161) in restricting the generic name *Bombax* (typified by *B. Ceiba*) to the American element; and in creating a new generic name (typ-

ified by *B. malabaricum*) for the Asiatic element. He likewise follows Schott & Endlicher in adopting *Salmalia* for this Asiatic element, and gives satisfactory evidence to show that it is impossible to take up *Gossampinus* as Bakhuisen has argued.

Sapota Achras Mill. See Achras Zapota *L.*

Sarcocephalus esculenta Afzel. See Nauclea esculenta (*Afzel.*) *Merr.*

Schoenocaulon officinalis (*Schlecht. & Cham.*) *A. Gray ex Bentham* Pl. Hartweg. (1840) 29.

Veratrum officinale Schlechtendal & Chamisso in Linnaea 6 (1831) 45.

Sabadilla officinarum Brandt in Hayne Arzneigewächse 13 (1837) t. 27.

Asagraea officinalis Lindley in Bot. Reg. 25 (1839) t. 33.

Sabadilla officinalis Standley in Standley & Calderon List. Prelim. Pl. S. Salvador (1925) 49.

The genus *Sabadilla* was originally proposed merely as a subgenus under *Veratrum*. This does not constitute valid publication; consequently *Schoenocaulon* must be maintained as the correct name for this genus.

Smilax aristolochiaefolia *Miller* Gard. Dict., ed. 8 (1768) no. 7.

Smilax medica Schlechtendal & Chamisso in Linnaea 6 (1831) 47.

Smilax Milleri Steudel Nomencl., ed. 2, 2 (1841) 599.

Smilax ornata Lemaire Ill. Hort. 12 (1865) pl. 439.

Smilax medica Schlecht. & Cham. See Smilax aristolochiaefolia *Mill.*

Smilax ornata Hook. See Smilax Regelii *Killip & Morton*

Smilax Regelii *Killip & Morton* in Carnegie Inst. Publ. 461 [Bot. Maya Area XII] (1936) 272.

Smilax grandifolia Regel Ind. Sem. Hort. Petrop. (1856) 16, non Buckley (1843).

Smilax ornata Hooker in Bot. Mag. 115 (1889), t. 7054, non Lemaire (1865).

Smilax utilis Hemsley in Hooker Ic. Pl. 26 (1899) t. 2589, non Wright (1895).

Stizolobium pruriens auct., non Medik. See Mucuna pruritum *Wight*

Tabebuia Donnell-Smithii Rose. See Cybistax Donnell-Smithii (*Rose*) *Seibert*

Taraxacum Dens-leonis Desf. See Taraxacum officinale *Weber ex Wiggers*

Taraxacum officinale *Weber ex Wiggers* Prim. Fl. Holsat. (1780) 56.

Leontodon Taraxacum Linnaeus Sp. Pl. (1753) 798, *pro parte.*

Leontodon vulgaris Lamarck Fl. Fr. 2 (1778) 113, *nomen illegitimum.*

Taraxacum vulgare Schrank Baier. Reise (1789) 11.

Taraxacum Dens-leonis Desfontaines Fl. Atlant. 2 (1798) 228.

Tecoma Peroba Record. See Paratecoma Peroba (*Record*) *Kuhlm.*

Thea sinensis L. See Camellia sinensis (*L.*) *O. Ktze.*

Tipuana Lundellii Standl. See Vatairea Lundellii (*Standl.*) *Killip*

Toluifera Pereirae Baill. See Myroxylon Pereirae *Klotzsch*

Triticum aestivum *Linnaeus* Sp. Pl. (1753) 85.
Triticum sativum Lamarck Fl. Fr. 3 (1778) 625.
Triticum vulgare Villars Hist. Pl. Dauph. 2 (1787) 153.

Triticum sativum Lam. See Triticum aestivum *L.*

Uncaria Gambir (*Hunt.*) *Roxburgh* Hort. Beng. (1814) 86, *nomen nudum*; Fl. Ind. 2 (1824) 126 (as *Gambier*).
Nauclea Gambir Hunter in Trans. Linn. Soc. 9 (1808) 218, t. 22.
Ourouparia Gambir Baillon Hist. Pl. 7 (1879) 350, 375.

Uncaria Schreber (1789) has been conserved over *Ourouparia* Aublet (1775).

Vanilla fragrans (Salisb.) Ames. See Vanilla planifolia *Andr.*

Vanilla planifolia *Andrews* Bot. Repos. 8 (1808) t. 538.
Epidendrum rubrum Lamarck Encycl. 1 (1783) 178, *quoad nomen non quoad plantam.*
Myrobroma fragrans Salisbury Parad. Lond. (1807) t. 82, (*nomen illegitimum*).
Vanilla fragrans Ames in Sched. Orch. 7 (1924) 36.

Myrobroma fragrans Salisb. must be considered an illegitimate name since the author failed to utilize an earlier specific epithet which he cited (even though incorrectly) in synonymy. Article 60 of the International Rules, as amended at Amsterdam, states that illegitimate names are not to be taken into consideration for purposes of priority. Salisbury's epithet, *fragrans*, is therefore not available, and it is possible to revert to Andrews' name for the Vanilla.

Vatairea Lundellii (*Standl.*) *Killip* in Trop. Woods no. 63 (1940) 5.

Tipuana Lundellii Standley in Carnegie Inst. Washington Publ. 461 [Bot. Maya Area IV] (1935) 65.

Vataircopsis Araroba (Aguiar) Ducke. See Andira Araroba *Aguiar*

Veronica virginica L. See Veronicastrum virginicum (*L.*) *Farwell*

Veronicastrum virginicum (*L.*) *Farwell* in Druggist's Circ. 61 (1917) 231.

Veronica virginica Linnaeus Sp. Pl. (1753) 9.
Leptandra virginica Nuttall Gen. No. Am. Pl. 1 (1818) 7.

Viburnum Opulus L. var. *americanum* Ait. See Viburnum trilobum *Marsh.*

Viburnum trilobum *Marshall* Arbust. Am. (1785) 62.

Viburnum americanum auct., non Miller (1768).
Viburnum Opulus L. β. *americanum* Aiton Hort. Kew. 1 (1789) 373.

Vouacapoua Araroba (Aguiar) Lyons. See Andira Araroba *Aguiar*

The reader is referred to Bot. Mus. Leafl. Harv. Univ. 7 (1939) 89-111 for a discussion of the following changes:

Berrya Ammonilla Roxb. = Berrya cordifolia (*Willd.*) *Burr.*

Manihot utilissima Pohl = Manihot esculenta *Crantz*

Mimusops Balata (Aubl.) Pierre = Manilkara bidentata (*A. DC.*) *Chev.*

Mimusops globosa auct. = Manilkara bidentata (*A. DC.*) *Chev.*

Myrica carolinensis auct., non Mill. = Myrica pensylvanica *Lois.-Desl.*

Pinus longifolia Roxb. = Pinus Roxburghii *Sarg.*

Sassafras variifolium (Salisb.) O. Ktze. = Sassafras albidum (*Nutt.*) *Nees*

Serenoa serrulata (Michx.) Hook.f. = Serenoa repens (*Bartr.*) *Small*

Sesamum orientale L. = Sesamum indicum *L.*

Toluifera Balsamum L. = Myroxylon Balsamum (*L.*) *Harms*

Tylophora asthmatica (L.) Wight & Arn. = Tylophora indica (*Burm.f.*) *Merr.*

BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, JULY 8, 1942 VOL. 10, NO. 7

ORCHIDACEAE PERUVIANAE IV

BY

CHARLES SCHWEINFURTH

THE PRESENT ARTICLE is the fourth of the series describing novelties in the orchid flora of Peru. It contains twelve species and three varieties which seem to be new.

Pleurothallis brevispicata *C. Schweinfurth sp. nov.*

Herba parva, epiphytica, caespitosa. Caules graciles, vaginis tubularibus arctis lepanthiformibus omnino tecti. Folia elliptica vel oblongo-elliptica, acuta, infra sensim angustata. Racemi unici vel quinque, folio subaequales, pauciflori, demum arcuati. Flores parvi, membranacei. Sepalum dorsale ovatum vel ovato-lanceolatum, acutum vel breviter acuminatum, concavum, trinervium. Sepala lateralia lanceolata vel anguste lanceolata, obliqua, acuminata, uninervia, carinata, apice recurva. Petala multo breviora, oblongo-obovata, apice late rotundata, uninervia. Labellum recurvum, expansum ovato-oblongum, apice rotundatum, parte basali bicarinatum. Columna perbrevis, pedata.

Plant small, epiphytic, caespitose, up to 12 cm. high. Roots fibrous, glabrous. Stems slender, rarely superposed, entirely concealed by close tubular sheaths, up to 10 cm. long, erect or spreading. Cauline sheaths lepanthiform, commonly five to seven, longitudinally nerved, terminating in spreading ovate marginate hispid mouths. Leaf small, gradually narrowed into a more or less dis-

tinct channelled petiole, elliptic to oblong-elliptic, up to 4.6 cm. long and 7 mm. wide, acute with a minutely tridenticulate apex, marginate, coriaceous. Inflorescences one to five, arising from just below the leaf-joint, shorter than to slightly exceeding the leaf, loosely few- (up to 9-) flowered, generally arcuate in anthesis. Floral bracts short, infundibuliform, acute. Flowers small, membranaceous. Dorsal sepal ovate-lanceolate or ovate, acute or short-acuminate, concave, 5.8–7.9 mm. long, 4 mm. wide, 3-nerved, dorsally carinate (especially below). Lateral sepals connate near the base, lanceolate or narrowly lanceolate, oblique, 4.8–7.1 mm. long and about 2 mm. wide at base of the free portion, long-acuminate, conspicuously 1-nerved, commonly with a short lateral supplementary nerve, carinate without, recurved at the apex. Petals much shorter than the sepals, oblong-obovate, 2.9–4 mm. long and about 2.1 mm. wide, broadly rounded above with more or less irregular margins, 1-nerved, slightly oblique. Lip small, recurved in natural position, when expanded ovate-oblong with the basal third slightly dilated, sessile at the rounded base, broadly rounded in front, 3 3.6 mm. long and about 2 mm. wide near the base, 1-nerved nearly to the apex and 3-nerved near the base; disc through the basal third with a pair of prominent fleshy keels which often have a tooth near the base and diminish toward the front. Column very short and stout with a conspicuous (more or less upcurved) subquadrate foot.

Pleurothallis brevispicata appears to be allied to the Colombian *P. lepanthoides* Schltr., but differs in having longer narrower leaves, fewer-flowered racemes and larger flowers. It differs from the Guatemalan *P. crucilabia* Ames & Correll in having dissimilar petals and lip.

Huanuco: Yanano, at about 1800 meters altitude, "densely covering small branches," May 13–16, 1923, *J. Francis Macbride 3838*,

(Type in Herb. Field Mus. No. 534901; Duplicate type in Herb. Ames No. 60980); Tambo de Vaca, at about 3900 meters altitude, on trees, flowers greenish white, June 10-24, 1923, *Macbride 4344, 4461a.* (*No. 4344* is a somewhat smaller plant vegetatively than the type and has shorter perianth segments); Alturas del Chaco, Santa Ana Valley, September 1928, *Herrera 2124a* (C. Bues coll.).

Pleurothallis caudatipetala *C. Schweinfurth sp. nov.*

Herba minuta, caespitosa, epiphytica. Radices crassae. Caules abbreviati, vaginis duabus celati. Folia obovata vel cuneato-spathulata, apice rotundata, marginata. Inflorescentiae unicae, saepe foliis breviores, uniflorae vel paucifloraе, floribus subumbellatis. Flores membranacei. Sepalum dorsale oblongo-lanceolatum, acutum, sparse longe ciliatum. Sepala lateralia in laminam elliptico-ovatam bidentatam connata, sparse longe ciliata. Petala a parte basali obovato-oblonga abrupte longe caudata. Labellum pandurato-oblongum, apice leviter retuso, marginibus maxima pro parte longe fimbriatis. Columna late alata.

Plant minute, epiphytic, caespitose, up to 1.5 cm. high. Roots fibrous, relatively stout, glabrous. Stems abbreviated, congested, monophyllous, invested by two tubular evanescent sheaths, up to 4 mm. long. Leaf obovate to cuneate-spatulate, up to 11 mm. long and 4 mm. wide, rounded or obtuse above with a median apicule, cuneate below, marginate, coriaceous. Inflorescences solitary, shorter than or subequaling the leaf, 1-flowered or fasciculately several-flowered. Flower small but large for the plant, membranaceous. Dorsal sepal oblong-lanceolate, acute, concave near the base, about 3.6 mm. long and 1.6 mm. wide, 3-nerved, sparingly long-ciliate. Lateral sepals connate into an elliptic-ovate lamina which is about 3.8 mm. long, sharply bidentate, obscurely 4-nerved, hirsute within and sparingly long-ciliate. Petals

about 3 mm. long and 1.1 mm. wide near the apex of the obovate-oblong basal portion, abruptly caudate above with the upper portion about 1.5 mm. long, 1-nerved. Lip pandurate-oblong, about 2 mm. long in the middle (including the short claw) and 1 mm. wide above and below the constriction, lightly retuse, provided at base with a pair of minute retrorse auricles, with the margins (except near the base and middle) long-fimbriate, with a pair of incurved fleshy thickenings at the center of the base. Column about 1.8 mm. long, broadly winged throughout, the wing being dilated toward the denticulate apex which is retuse with irregularly cellular-ciliolate margins.

Pleurothallis caudatipetala is similar to *P. barbulata* Lindl., but has very different petals.

JUNIN: Chanchamayo Valley, at 1500 meters altitude, March 1930, *Carlos Schunke 1307*. (TYPE in Herb. Field Mus. No. 622342).

Pleurothallis chamensis *Lindley* var. **tenuis** *C. Schweinfurth var. nov.*

Planta et habitu graciliore et folio ad apicem angustato et flore tenuiore a specie differt.

Plant epiphytic, slender, up to 10.5 cm. tall (base of longest stem incomplete). Rhizome abbreviated, plant caespitose. Stem slender, angulate. Leaf ovate to elliptic, distinctly narrowed above to an obtuse minutely tridentate apex, broadly cuneate or rounded at the base, 2.9–4.5 cm. long, 1.4–2.4 cm. wide. Inflorescences abbreviated, arising from the base of the leaf. Flowers very similar to those of the species but of thinner texture, "dark maroon with yellow-tipped petal."

Considering the great variability of *Pleurothallis chamensis* both vegetatively and florally, it seems advisable to recognize this collection, which appears outwardly so dissimilar, merely as a variety of that species.

HUANUCO: Churubamba District, Hacienda Mercedes, Cotirarda, epiphytic on tree trunks, at 1560 meters altitude, September 21, 1936, *Ynes Mexia 8215a.* (TYPE in Herb. Ames No. 46837).

Pleurothallis dilatata *C. Schweinfurth sp. nov.*

Herba mediocris, rhizomate adscendente. Caules approximati, trivaginati, vaginis tubulatis evanidis obtecti. Folium unicum, elliptico-oblongum, apice rotundatum, ad basim angustatum, in sicco valde coriaceum. Inflorescentiae unicae vel duae, folium conspicue superantes, usque paene ad basim racemosae. Flores majores. Sepalum dorsale oblongo-oblanceolatum, obtusum, trinervium, intus supra pubescens. Sepala lateralia falcato-decurva, in laminam elliptico-ovatam bilobatam connata, intus supra pubescentia. Petala sepalis breviora, falcato-spathulata, apice rotundata, trinervia. Labellum valde arcuatum, expansum basi apiceque anguste oblongum et medio ovato-dilatatum, apice rotundatum. Columna gracilis, arcuata, in pedem conspicuum producta.

Plant medium-sized, with an ascending rhizome, up to 18.5 cm. tall. Roots numerous, fibrous, glabrous. Stems approximate, up to 6.5 cm. tall, concealed by three tubular evanescent sheaths, plurisulcate in the dried specimen. Leaf solitary, elliptic-oblong, rounded at the apex with a minutely tridenticulate tip, cuneate-narrowed to a sessile base, up to 7.5 cm. long and about 1.5 cm. wide, thickly coriaceous, finely punctate beneath in the dried specimen. Inflorescences one or two, axillary, suberect to flexuous, much exceeding the leaf, up to 13.5 cm. long, loosely racemose nearly to the base. Floral bracts infundibuliform, scarious, acute, glabrous, much shorter than the pedicellate ovary. Flowers rather large for the plant, with sepals spreading. Dorsal sepal oblong-oblanceolate, 10–10.5 mm. long, 3.1–3.2 mm. wide, obtuse, 3-nerved, finely short-pubescent within (except near the concave base) and on the margins, carinate

without through the lower half. Lateral sepals falcate-decurved, 8.5–9 mm. long, connate into an elliptic-ovate bilobed lamina about 5 mm. wide which is 6-nerved, bicarinate without below the middle and finely pubescent within and on the margins (except near the base), forming a prominent mentum with the column-foot, the apex of the sepals is subacute. Petals smaller than the sepals, falcate-spatulate, about 6.3 mm. long, 2.8–3 mm. wide, broadly rounded above, 3-nerved in the middle with the center thickened above the nerves. Lip strongly arcuate in natural position with the sides of the dilated median portion incurved; when expanded about 6.5 mm. long, 3-nerved, from a narrow elongate claw-like portion rather abruptly semiovate-dilated on each side (about 2.2 mm. across), then gradually narrowed into an oblong apically rounded lamina which is slightly longer than the basal portion, denticulate on the apical margins, with the surface of the apical portion irregularly papillose; a low intramarginal keel extends from the lower part of the dilated portion on each side nearly to the apex. Column slender, dilated below, arcuate, about 4 mm. long at the back, slenderly winged with a cucullate apex, provided with a prominent foot.

Pleurothallis dilatata differs from the similar *P. trilineata* Lindl. in having eciliate floral bracts, connate lateral sepals and a more slender lip. It varies from *P. asperilinguis* Reichb.f. in having broader sepals, obtuse petals and a narrower lip.

The specific name is in allusion to the dilated middle portion of the lip.

HUANCAVELICA: Prov. Tayacaja, Montepungo, 5 kilometers east of Surcubamba, at 3000 meters altitude, epiphyte on mossy tree trunk, flower pale greenish yellow, January 13, 1939, *H. E. Stork & O. B. Horton 10388*. (TYPE in Herb. Univ. Calif.).

Pleurothallis echinocarpa *C. Schweinfurth sp. nov.*

Herba caespitosa cum rhizomate repente. Caules breves, approximati, robusti, vagina scariosa infra velati. Folium lineari-oblongum vel oblongo-ellipticum, acutum, sessile, valde coriaceum. Inflorescentia unica, folium conspicue superans. Racemus laxe pluriflorus, rhachide fractiflexa. Flores mediocres, carnosi. Sepalum dorsale ovato-lanceolatum, acutum, concavum. Sepala lateralia ovato-lanceolata, valde obliqua, acuminata, dorso carinata. Petala breviora, elliptico-lanceolata, acuta vel breviter acuminata, basi utrinque unidentata. Labellum oblanceolato-oblongum, apice denticulato rotundatum, infra medium valde incrassatum, a latere visum infra medium utrinque semiorbiculari-lobatum. Columna crassa. Ovarium dense muricatum.

Plant medium-sized, with an abbreviated ascending rhizome, epiphytic, up to 20 cm. tall. Roots fibrous, glabrous. Stems stout, short, subterete, approximate, up to 3.5 cm. long, monophyllous, concealed below by one or two membranaceous evanescent sheaths, apparently slightly dilated near the apex. Leaf erect, linear-oblong to narrowly elliptic, up to 11.3 cm. long and 2 cm. wide, acute, mucronate, sessile at the cuneate base, thickly coriaceous. Inflorescence solitary, axillary, erect or suberect, stout, up to 16.3 cm. long, much surpassing the leaf, sheathed at base by a short conduplicate spathe up to 1.1 cm. long. Peduncle below the raceme up to 9.2 cm. long, slightly complanate, provided with two or three infundibuliform sheaths. Raceme up to 8.5 cm. long, about 9-flowered or less, loose, with a fractiflex rachis. Floral bracts infundibuliform, complanate, broadly carinate. Flowers medium-sized, campanulate, fleshy. Dorsal sepal ovate-lanceolate, acute, concave, carinate at the apex, 9.5–9.8 mm. long, 4–4.4 mm. wide, 9-nerved. Lateral sepals obliquely ovate-lanceolate or triangular-

lanceolate, navicular, acuminate, 10–10.2 mm. long, 4.2–4.5 mm. wide, carinate especially toward the apex, 8-nerved. Petals elliptic-lanceolate, acute or shortly acuminate, 6.2–6.5 mm. long and 2 mm. wide, slightly oblique, with a small tooth on each side near the base, not decurrent on the column, 5-nerved. Lip 6–6.4 mm. long, 2.5–2.8 mm. wide above the middle, oblanceolate-oblong when viewed from the front, minutely denticulate at the broadly rounded apex, with the auriculate sides near the base slightly incurved, those just below the middle incurved and separated by a large fleshy apically bilobed thickening and the anterior portion cymbiform; when viewed from the side, the margins embracing the fleshy thickening are semiorbicular-lobulate and denticulate toward the front. Column stout, slightly arcuate, about 4.2 mm. long, terminating in a short denticulate wing, with the anterior surface flattened. Ovary densely muricate.

Pleurothallis echinocarpa is apparently very similar to *P. Otopetalum* Schltr. (*Otopetalum tunguraguae* Lehm. & Kränzl.) judging from the description, but I have not seen any examples of that concept. *P. Otopetalum* seems to differ specifically in having more than twice longer inflorescences as well as in characters of the lip. It is a more slender plant than *P. gigantea* Lindl. and lacks the spreading lateral lobes of the lip of that species. The fact that the petals are free from the column distinguishes this species from *P. muricata* Schltr.

HUANUCO: Muña, at about 2100 meters altitude, "in dry wood. The 3 large parts reddish-green; inner yellowish-green," May 23–June 4, 1923, *J. Francis Macbride 3969*. (TYPE in Herb. Field Mus. No. 535031; DUPLICATE TYPE in Herb. Ames No. 60979).

Pleurothallis inaequisepala *C. Schweinfurth sp. nov.*

Herba parvula, caespitosa. Caules filiformes, dense aggregati, vaginis paucis lepanthiformibus arctis omnino velati. Folium obovatum vel oblanceolatum vel ellipticum, ad basim angustatum, apice obtusum vel rotundatum, marginatum, valde coriaceum. Inflorescentiae foliis multo breviores, racemosae, paucae, bi-vel quadriflorae. Flores parvi. Sepalum dorsale valde cucullatum, ovatum, longe caudatum. Sepala lateralia reflexa, triangulari-linearia, basi breviter connata, uninervia, conduplicata. Petala multo breviora, oblique elliptico-lanceolata, leviter sigmoidea, acuta vel acuminata. Labellum simplex, ovatum vel rhombico-ovatum, obtusum, basi cuneatum. Columna petalorum dimidio subaequalis, crassa, arcuata.

Plant small, slender, caespitose. Roots fibrous, glabrous, relatively stout. Stems crowded, filiform, occasionally superposed, entirely concealed by tubular lepanthiform sheaths, up to 5.5 cm. tall (excluding the upper short branches). Cauline sheaths commonly five or six, close, glabrous, longitudinally nerved, terminating in an infundibuliform marginate hispid mouth. Leaf obovate to oblanceolate (sometimes almost elliptic), more or less gradually narrowed to a short sulcate petiole, obtuse to rounded above with a minutely tridenticulate apex, up to 3.1 cm. long (rarely) and 7 mm. wide (in the dried specimen), thickly coriaceous, marginate. Inflorescences racemose, very short and diffuse, commonly two to four, about 2- to 4-flowered, very loose, conspicuously shorter than the leaf. Flowers small, membranaceous. Dorsal sepal strongly cucullate, ovate, about 5 mm. long in natural position and 2.4 mm. wide, rather abruptly caudate with the tail about 1.8 mm. long, 3-nerved, with the nerves slightly carinate. Lateral sepals reflexed above the base, linear-triangular, shortly connate near the base, very slightly adnate to the dorsal sepal, about 4.4 mm. long, slightly falcate, long-attenuate, 1-nerved, condu-

plicate, dorsally carinate. Petals much shorter than the sepals, very obliquely elliptic-lanceolate, lightly sigmoid, acute or acuminate, 1-nerved, about 2.2 mm. long and 0.50–0.75 mm. wide, with irregular upper margins. Lip simple, ovate or rhombic-ovate with the lower sides incurved in natural position, broadly obtuse, broadly cuneate at the base, about 1.5 mm. long and 1 mm. wide when expanded, 3-nerved through the lower half, densely minute-papillose throughout except near the base. Column about one half as long as the petals, stout, arcuate.

Pleurothallis inaequisepala suggests the Ecuadorian *P. microcharis* Schltr. in habit. Its smooth-margined sepals and simple lip distinguish this species from *P. chamaelepanthes* Reichb.f.

CUZCO: "Valle de Santa Ana, alturas del Chaco. 3666 mtrs," August 12, 1928, *F. L. Herrera 2125* (C. Bues coll.). (TYPE in U.S. Nat. Herb. No. 1422530; DUPLICATE TYPE in Herb. Ames No. 60985).

Pleurothallis lanceolata *Lindley* var. **gracilis** *C. Schweinfurth var. nov.*

Herba gracilis, folio minore et racemo longiore et sepalis lateralibus omnino coalitis et labello non naviculari a specie differt.

Plant slender, variable. Stems 4.5–11 cm. tall. Leaf prominently petioled like that of the type; lamina elliptic to narrowly elliptic-oblong, up to 10.5 cm. long and 2.7 cm. wide. Raceme commonly much surpassing the leaf, sometimes over 20 cm. long (tip incomplete). Sepals about 2.1 cm. long, lateral ones entirely connate (not bidentate). Lip slightly concave, but not navicular as in the species.

This collection perhaps represents a new species, but without having examined a flower from the type of *Pleurothallis lanceolata*, such treatment appears to be unwise at present.

San Martin: Zepelacio, near Moyobamba, at 1200-1600 meters altitude, epiphyte in forest, flowers greenish violet, *G. Klug 3563*. (Type in Herb. Ames No. 60897).

Pleurothallis longiserpens *C. Schweinfurth sp. nov.*

Herba scandens, saxicola, funiformis. Radices numerosae. Rhizoma elongatum. Caules secundarii breves, graciles, adpressi. Folia lineari-oblanceolata, adscendentia, apice acuta, infra longe angustata. Inflorescentiae unicae vel plures, sub caulis apice, fasciculatae, uni- vel bifforae. Sepalum dorsale valde cucullatum, a basi oblongo-elliptica abrupte longe caudatum. Sepala lateralia lineari-lanceolata, sensim caudato-acuminata, usque prope basim libera. Petala multo breviora, spathulato-obovata, apice late rotundata, uninervia. Labellum panduratum vel trilobatum; pars inferior expansa oblato-suborbicularis, pars superior ovato-suborbicularis, fimbriato-lacerata, valde mucronata, superficie papillis dense ornata. Columna parva, crassa, cum pede in cornu validum incurvum terminante.

Plant long-creeping, medium-sized, funiform. Rhizome slender, concealed by a thick bundle of fleshy roots. Secondary stems short, slender, appressed to the rhizome, up to 5 cm. long, concealed by tubular evanescent sheaths, apparently 1-jointed above the middle. Leaves ascending, linear-oblanceolate, up to 8 cm. long and 8 mm. wide, minutely tridenticulate at the acute apex, gradually narrowed to a sessile base, coriaceous, with margins revolute in the dried specimen. Inflorescences fascicled below the apex of the stem, one to several, abbreviated, 1- or 2-flowered, in the axil of a scarious sheath which is about 1.5 cm. long. Flower rather large, ringent. Dorsal sepal strongly concave, 17.2–21.2 mm. long and 6–6.4 mm. wide, membranaceous, 3-nerved, with the lower portion oblong-elliptic and abruptly narrowed to a

cauda which is 6.3–10.4 mm. long, dorsally carinate along the mid-nerve. Lateral sepals free nearly to the base, obliquely linear-lanceolate, gradually caudate-acuminate, 17–21.1 mm. long and 2.5 mm. wide, 2-nerved, dorsally carinate along the inner nerve. Petals much shorter than the sepals, spatulate-obovate, 4.5–5 mm. long and 4 mm. wide, broadly rounded above with irregular margins (sometimes retuse or acute in the middle), 1-nerved, membranaceous. Lip pandurate or 3-lobed, 5.3–6 mm. long, sessile; basal portion with the erect semiorbicular sides or lobes complicate in the middle in natural position, membranaceous, 2.6–3 mm. long and 4–4.5 mm. across the lip when expanded; anterior portion ovate-suborbicular, slightly narrower than the expanded basal part, prominently mucronate, irregularly fimbriate-lacerate, with the surface densely covered with papillae; disc complicate and fleshy-thickened below in the middle with the thickened portion extended into a pair of short ridges. Column short, fleshy, dilated at the apex both dorsally and ventrally, 2.2–2.8 mm. long at the back, with a short stout foot which terminates in a porrect incurved free horn. Ovary triquetrous with the angles fleshy-alate.

Pleurothallis longiserpens recalls *P. macrorhiza* Lindl. in habit. It differs from *P. soratana* Reichb.f. in having caudate sepals, very small 1-nerved petals and somewhat dissimilar lip.

AYACUCHO: Prov. Huanta, mountains northeast of Huanta, on rocks at 3100-3200 meters altitude, February 1-10, 1926, *A. Weberbauer 7510* (TYPE in Herb. Ames No. 60978; DUPLICATE TYPE in Herb. Field Mus. No. 562417).

Pleurothallis quadrata *C. Schweinfurth sp. nov.*

Herba parvula, dense caespitosa. Caules congesti, breves, vaginis duabus tubulatis velati. Folium ovale,

valde coriaceum, apice rotundatum, basi abrupte et breviter petiolatum. Inflorescentiae saepissime duae, quam folium multo longiores, tenues, erectae, supra dense racemosae. Flores minuti, semiglobosi. Sepalum dorsale valde cucullatum, suborbiculare, trinervium, dorso carinatum. Sepala lateralia parte inferiore connata, valde concava, elliptico-ovata, trinervia, dorso carinata. Petala minora, oblongo-subquadrata, apice truncato retusa, uninervia. Labellum tubulari-involutum, basi concavum, expansum quadratum, apice late truncatum, crasso cum callo angulo exteriore utrinque praeditum. Columna pedata.

Plant small, caespitose, up to 16 cm. high. Roots fibrous, glabrous, numerous. Stems crowded, 2–4 cm. tall, monophyllous, mostly concealed by two loose tubular sheaths which are imbricating and glabrous. Leaf thickly coriaceous, abruptly narrowed to a short petiole; lamina oval, up to 3.9 cm. long and 1.9 cm. wide, minutely retuse at the rounded apex, rounded or broadly cuneate at the base, marginate; petiole short, slender, channelled, up to 8 mm. long. Inflorescences commonly one or two (occasionally remnants of old peduncles are present), much surpassing the leaf, up to 12.6 cm. long, rather densely many-flowered above, very slender, erect or nearly so. Floral bracts very small, infundibuliform, nearly equaling the pedicels. Flowers minute, rose-red, faintly mottled with purple, semiglobose. Dorsal sepal strongly cucullate, rounded at the apex, suborbicular, about 2.1 mm. long, 3-nerved, dorsally carinate, with margins minutely cellular-ciliolate. Lateral sepals connate to about the middle to form a deeply concave lamina about 2.2 mm. long, each sepal elliptic-ovate, 3-nerved, dorsally carinate, obtuse or rounded at the apex. Petals oblong-subquadrate, retuse at the truncate apex, about 1.5 mm. long and half as broad, 1-nerved, sometimes

with a short supplementary nerve. Lip tubular-involute in natural position, concave at base, quadrate when expanded, about 1.5 mm. long and wide, truncate in front with a short broad fleshy callus at each apical angle, 3-nerved. Column short, stout, large for the flower, about 1.2 mm. long at the back, with a stout ovoid foot.

Pleurothallis quadrata appears to be without close allies. The specific name is in allusion to the expanded lip.

JUNIN: Schunke Hacienda, above San Ramón, at 1400-1700 meters altitude, epiphyte in dense forest, June 8-12, 1929, *E. P. Killip & A. C. Smith 24856*. (TYPE in U.S. Nat. Herb. No. 1359136).

Pleurothallis ringens *C. Schweinfurth sp. nov.*

Herba epiphytica, caespitosa. Caules teretes, prope basim uniarticulati, vaginis basilaribus evanidis obtecti. Folium erectum, conspicue petiolatum; lamina ovalis vel ovato-elliptica, apice rotundata vel obtusa: petiolus gracilis, supra sensim dilatatus. Inflorescentiae abbreviatae, unifloraе, in spathae conspicuae axilla. Flos ringens. Sepalum dorsale valde cucullatum, lanceolato-ovatum, acutum vel breviter acuminatum. Sepala lateralia in laminam oblongo-lanceolatam navicularem valde bidentatam connata. Petala lineari-lanceolata, prope basim subquadratam utrinque unidentata. Labellum profunde trilobatum, in positu naturali sigmoideum; lobi laterales parvi, porrecti, arcuato-oblongi, obliquissime bidentati: lobus medius multo major, anguste triangulari-ovatus, apice incurvus. Columna brevis, ad basim sensim dilatata.

Plant caespitose, medium-sized, up to 27 cm. tall from the base of the plant to the apex of the erect leaf. Roots fibrous, glabrous, white or whitish, numerous. Stems terete, monophyllous, up to 16.5 cm. tall, 1-jointed near the base, provided below the middle with two close tubular evanescent sheaths of which the lower shows minutely scabrous nerves. Leaf erect, long-petioled; lamina

oval or ovate-elliptic, rounded or obtuse above with a minutely tridenticulate apex, rounded or broadly cuneate below, up to 8.5 cm. long and 4.2 cm. wide, chartaceous in the dried specimen; petiole 1.5–2 cm. long, slender, channelled, gradually merging into the lamina. Inflorescences abbreviated, 1-flowered, few to numerous, in the axil of a conspicuous conduplicate spathe which is about 1.6 cm. long and minutely scabrous below. Flowers medium-sized, ringent. Dorsal sepal strongly cucullate, lanceolate-ovate when expanded, about 12.3 mm. long and 6.3 mm. wide, acute or short-acuminate, 3-nerved, membranaceous. Lateral sepals connate into an oblong-lanceolate navicular lamina which is sharply bidentate, about 11.8 mm. long and 4 mm. wide, 4-nerved, membranaceous. Petals linear-lanceolate in outline, 7.5–8 mm. long, with a short subquadrate basal portion which terminates in a pair of unequal teeth (one on each side), acute, 1-nerved throughout or 3-nerved to the middle. Lip sigmoid, about 6.4 mm. long in natural position, deeply 3-lobed, with the lateral lobes erect and parallel, the lower sides of the mid-lobe erect and the sides of its rather fleshy upper portion revolute; lateral lobes porrect, arcuate-oblong from an indistinct cucullate claw, very obliquely bilobed above, obtuse with the margins cucullate-incurved; mid-lobe much larger, shortly clawed, narrowly ovate-triangular when expanded, about 6 mm. long and 4 mm. wide at the rounded base, narrowed to an obtuse apex, 3-nerved to the middle with the elongate mid-nerve clavate-thickened near the apex and prominent on the under surface; a small fleshy bilobed callus stands between the lateral lobes and there is a pair of short fleshy thickenings near the base of the mid-lobe. Column very short, about 2.4 mm. long at the back, gradually much dilated toward the base.

This species is very similar to *P. Hitchcockii* Ames

from British Guiana. It differs, however, in having a more robust habit, broader leaves, smaller and less acuminate sepals and a narrower lip which is incurved at the apex.

JUNIN: La Merced, Hacienda Schunke, at about 1200 meters altitude, "epiphyte, translucent with red lines," August 27-September 1, 1923, *J. Francis Macbride 5618*. (TYPE in Herb. Field Mus. No. 536657; DUPLICATE TYPE in Herb. Ames No. 58751); Chanchamayo Valley, at 1500 meters altitude, September 1929, *Carlos Schunke 1097* (flowers rather smaller); same locality at 1200 meters altitude, September 1930, *Schunke 1110*.

Pleurothallis spathulifolia *C. Schweinfurth sp. nov.*

Herba nana, epiphytica, rhizomate breviter repente. Radices crassae. Caules perbreves, vaginati. Folium spathulatum, apice rotundatum, infra longe angustatum, marginatum. Inflorescentiae unicae vel duae, quam folia multo longiores, laxe racemosae. Flores membranacei. Sepalum dorsale lanceolatum, acutum, concavum. Sepala lateralia in laminam elliptico-ovatam usque ad medium bidentatam connata. Petala oblique elliptico-lanceolata, acuta. Labellum ovato-oblongum, antice rotundatum, basi callo V-formi instructum. Columna late alata cum ala apice trilobata.

Plant dwarf, with the rhizome shortly creeping. Roots fibrous, glabrous, stout for the plant. Stems very short, 3–4 mm. long, enclosed by one to three loose tubular evanescent glabrous sheaths. Leaf spatulate, up to 1.6 cm. long and 6 mm. wide, rounded at the apex with a minutely tridenticulate tip, gradually long-narrowed below, marginate, subcoriaceous. Inflorescences one or two, filiform, much surpassing the leaf, few- (up to 11-) flowered above, rather loose. Floral bracts minute, infundibuliform, aristate, about equaling the recurved pedicels. Flowers small, membranaceous. Dorsal sepal lanceolate,

concave, acute, 3-nerved, about 3 mm. long and 1.2 mm. wide. Lateral sepals acute at the apex, connate almost to the middle to form an elliptic-ovate concave lamina which is about 3 mm. long and is 4-nerved. Petals obliquely elliptic-lanceolate, acute, 1-nerved, about 2.3 mm. long and 1 mm. broad, with minutely irregular margins. Lip ovate-oblong, simple, lightly contracted on each side above the middle, about 1.8 mm. long and 1 mm. wide near the base, broadly rounded and denticulate in front, subtruncate at the base with a pair of minute retrorse auricles, provided in the middle of the base with an inverted V-shaped keel, 3-nerved. Column about 1.4 mm. long, slightly arcuate, broadly winged (especially above) with a 3-lobed termination of which the lobes are denticulate, provided with a short concave foot.

The form of the petals distinguishes this species from its allies *P. fuegii* Reichb.f., *P. subsinuata* Lindl. and *P. truncicola* Reichb.f.

AYACUCHO: **Aina, between Huanta and Río Apurimac,** epiphyte in open woods, at 750-1000 meters altitude, "segments pinkish red, green at base and at margin," May 7, 17, 1929, *E.P.Killip & A.C. Smith 23159*. (TYPE in U.S. Nat. Herb. No. 1357922).

Pleurothallis Talpinaria *Reichenbach filius* in Flora 69 (1886) 554.

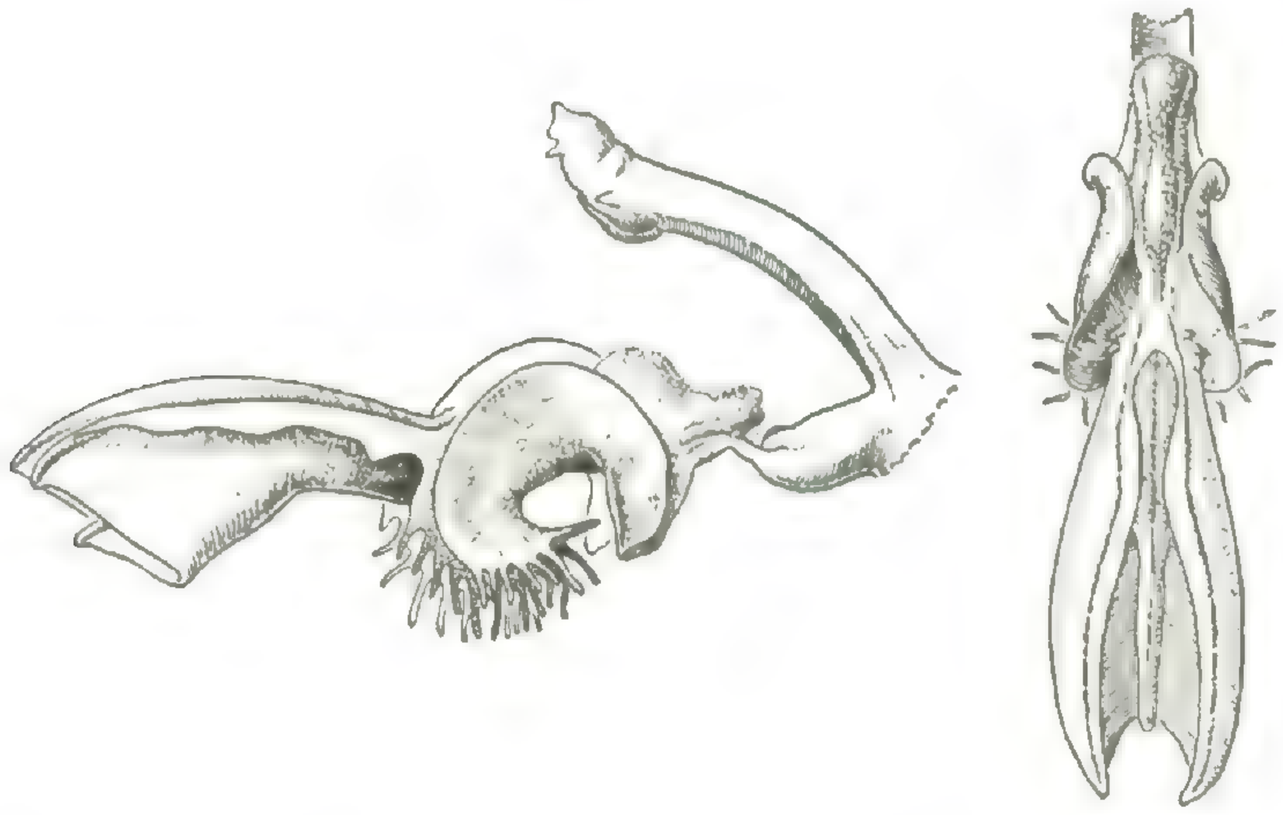
Talpinaria bivalvis Karsten Fl. Columb. 1 (1859) 153, t. 76, non *Pleurothallis bivalvis* Lindl.

Pleurothallis trimeroglossa Schlechter in Fedde Repert. Beih. 9 (1921) 78; ex Mansfeld in Fedde Repert. Beih. 57 (1929) t. 115, nr. 452.

It is evident from a comparison of specimens of the type number of *Pleurothallis trimeroglossa* with the plate and description of *Talpinaria bivalvis* that we are dealing with one species.

In *P. trimeroglossa*, the stems are provided with only two sheaths (not three as described), and these sheaths

scarcely reach beyond the middle of the stems (not altogether concealing them, as stated). The spathe which embraces the peduncles is about 1.5 cm. or less long, whereas it is 2 cm. long in *Talpinaria bivalvis*. The flowers are slightly smaller than those described in *T. bivalvis*, while the petals are markedly shorter than the sepals and not almost equaling them as in *T. bivalvis*.



Lip and column, from side, ten times natural size.
Lip, from above, natural position, ten times natural size.

Judging by a careful examination of the type collection of *Pleurothallis trimeroglossa*, the lip has been interpreted incorrectly by both Karsten and Schlechter. The lower half of the lip has a high flattened pubescent central keel enclosed by a pair of erect conduplicate semiorbicular-lunate lobes which are lacerate-fimbriate in front and recurved; the anterior half is elliptic, or flabellate when expanded, and is prominently tridentate in front.

The origin of *Talpinaria bivalvis* was said to be Colombia and Venezuela, while *Pleurothallis trimeroglossa* came from the Department of Junín in Peru.

Pleurothallis tenuis *C. Schweinfurth sp. nov.*

Herba parva, caespitosa, epiphytica. Caules graciles, simplices, unifoliati, vaginis paucis infundibuliformibus

omnino obtecti. Folium ellipticum, subacutum vel obtusum, basi in petiolum perbrevem angustatum. Inflorescentiae unicae vel duae, folia valde superantes. Racemi laxe pluriflori. Pedicelli longi, arcuati vel patentes. Flores parvi. Sepalum dorsale lanceolatum, longe acuminatum, concavum, trinervium, dorso carinatum. Sepala lateralia fere libera, triangulari-linearia, uninervia, dorso carinata. Petala multo minora, oblique elliptico-lanceolata, acuta vel acuminata, uninervia. Labellum lanceolatum, infra medium obscure trilobatum, antice in apicem obtusum angustatum; discus basi incrassatus. Columna gracilis, pedata.

Plant small, caespitose, about 6 cm. tall. Roots fibrous, glabrous, long for the plant. Stems short and slender, simple, spreading, monophyllous, entirely clothed with sheaths, up to 3 cm. long, often with a decumbent base. Cauline sheaths five or less, lepanthiform, minutely scabrous along the longitudinal nerves, infundibuliform above with a flaring marginate hispidulous mouth. Leaf elliptic, subacute to rounded above with a minutely tri-denticulate apex, in the dried specimen shortly petioled at the broadly cuneate base, up to 2.7 cm. long and 9 mm. wide, thickly coriaceous. Inflorescences one or two, arising just below the joint of the leaf, capillary, much surpassing the leaf, arcuate, up to 5 cm. long (including the flowers), loosely few- (up to 10-) flowered. Pedicels arcuate or spreading, much exceeding the minute infundibuliform floral bracts. Flowers small but large for the plant; segments little spreading. Dorsal sepal lanceolate, concave below, rather abruptly long-acuminate above, about 7 mm. long and 2.3 mm. wide near the base, 3-nerved, dorsally carinate especially through the lower part with the keel produced onto the ovary. Lateral sepals triangular-linear or lanceolate-linear, free nearly to the base, about 7.2 mm. long and 1 mm. wide at the

base, 1-nerved, forming a short mentum with the column-foot, dorsally carinate with the keels extending onto the ovary. Petals much shorter than the sepals, very obliquely elliptic-lanceolate, about 3.5 mm. long and 1.1 mm. wide near the middle, acute or acuminate with more or less irregular upper margins, 1-nerved. Lip lanceolate, in natural position with incurved lower margins and recurved apex, when expanded about 3.5 mm. long and 1.7 mm. wide below, cuneate at the base, the lower third dilated into indistinct broadly rounded lobules, the upper portion gradually narrowed to the obtuse apex, 3-nerved through the lower half; lamina fleshy-thickened near the base in the middle, densely minute-papillose above. Column slender, slightly arcuate, dilated at the base, terminating in a trilobulate wing, about 2 mm. long, with a short broad fleshy foot.

Pleurothallis tenuis is apparently allied to the Colombian *P. intricata* Lindl., but differs in the structure of the lip.

Cuzco: *F. L. Herrera 2157* (C. Bues coll.). (Type in U.S. Nat. Herb. No. 1423521). Ayacucho: Aina, between Huanta and Río Apurimac, at 750-1000 meters altitude, epiphyte in dense forest, May 7, 17, 1929, *E. P. Killip & A. C. Smith 22539*. This collection, which consists of advanced specimens with withered flowers on the summit of rounded ovaries, shows one plant about 11 cm. high, with stem about 4 cm. long bearing six hirsute sheaths; another stem bears a leaf about 3.5 cm. long and 1.1 cm. wide; one inflorescence is about 8 cm. long and bears eighteen flowers.

Pleurothallis Vargasii *C. Schweinfurth sp. nov.*

Herba robusta. Caulis crassus, vaginis duabus vel tribus laxis ornatus. Folium oblongo-ellipticum vel ovale, apice rotundatum vel leviter emarginatum, sessile vel subsessile, valde coriaceum. Inflorescentiae plures, erectae, folio subaequales vel paulo longiores, dense multiflorae. Sepala intus dense pubescentia, extus leviter carinata. Sepalum dorsale ovato-oblongum, apice rotun-

dato apiculatum, quinquenervium. Sepala lateralia lanceolato-oblonga, acuta, leviter obliqua, trinervia. Petala sepalis multo breviora, elliptico-obovata, apice rotundata, trinervia. Labellum quam petala brevius, leviter trilobatum, apice rotundatum, cum lobulis lateralibus semiobovatis et incurvis. Columna abbreviata, breviter pedata.

Plant robust, probably caespitose (base of stem and rhizome not present). Stem stout, up to 15.5 cm. high, provided with two or three loose tubular scarious sheaths; uppermost sheath separate, much the largest, up to 7.5 cm. long. Leaf oblong-elliptic to oval (often slightly broader above the middle), sessile or subsessile, 11.4–15.5 cm. long, 4.7–7.5 cm. across, broadly rounded and slightly retuse at the apex, cuneate below, thickly coriaceous in the dried specimen, many-nerved with the mid-nerve sulcate above and prominently carinate beneath. Racemes four to six, erect or suberect, densely many-flowered, apparently secund, up to 19 cm. long, shorter than or slightly surpassing the leaf, issuing from a prominent conduplicate shining spathe which is up to 4.2 cm. long. Floral bracts short, infundibuliform. Flowers small for the plant, campanulate with but slightly spreading segments. Sepals subfleshy, closely pubescent within except near the base, lightly carinate without. Dorsal sepal slightly adnate to the lateral sepals at the base, strongly concave below, ovate-oblong, 9.5–10 mm. long, 4.8–5 mm. wide, abruptly rounded and apiculate at the apex, 5-nerved. Lateral sepals lanceolate-oblong, acute, concave below, slightly oblique, 9–9.5 mm. long, about 3.2 mm. wide, 3-nerved (sometimes with a short supplementary nerve), more or less connate near the base. Petals much smaller than the sepals, elliptic-obovate, 4–4.5 mm. long, 2.2–2.7 mm. wide, rounded at the apex, 3-nerved. Lip smaller than the petals, fleshy, lightly 3-lobed, 3-nerved, slightly arcuate in natural position with concave

base incurved sides and flat slightly recurved apex, about 3.7 mm. long, 2.4 3.4 mm. wide (when forcibly expanded), broadly rounded at the apex, cuneate at the base with the lateral margins forming intramarginal semiobovate lobules which end above the middle of the lip. Column minute, stout, about 1.7 mm. long at the back, provided with an abbreviated semiorbicular fleshy foot.

Pleurothallis Vargasii appears to be related to *P. Cassidis* Lindl. and to *P. expansa* Lindl., but has a dissimilar lip from that of both species.

APURIMAC: Prov. Abancay, "bosques altos de Ampay," at 3700 meters altitude, epiphyte (also on the ground), roots branching, June 1938, *C. Vargas 1075*. (TYPE in Herb. Gray No. 7439); *Vargas 2049*.

Octomeria boliviensis *Rolfe* var. **grandifolia** *C. Schweinfurth var. nov.*

Herba valde variabilis, caulibus saepissime longioribus et foliis saepissime majoribus et labello basi leviter auriculato a specie differt.

Plant very variable. Stems ranging from 7.5 to 42.3 cm. long. Leaf elliptic-linear to narrowly elliptic-lanceolate, varying (when mature) from 11.7 to 27.7 cm. long including the short petiole and from 1.6 to 3.7 cm. wide. Flowers cream-color, yellow and dark red. Dorsal sepal elliptic-lanceolate, acute, about 1.2 cm. long and 4.5 mm. wide. Lateral sepals similar, slightly oblique. Petals obliquely elliptic-lanceolate, somewhat shorter than the sepals. Lip about 6.5 mm. long, sharply 3-lobed in the middle; lower portion pandurate with a more or less auriculate base; lateral lobes erect in natural position, small, obliquely semiovate, porrect, rounded at the apex; mid-lobe rhombic-ovate, broadly truncate in front with a more or less sharply 3-lobulate apex, erose-denticulate on the margins except near the base; disc with a pair of keels similar to those of the type.

Loreto: Pumayacu, between Balsapuerto and Moyobamba, at 600-1200 meters altitude, epiphyte in forest, August-September, 1933, flowers cream-color, yellow and dark red, *G. Klug 0.15*. (Type in Herb. Ames No. 60986; Duplicate type in Herb. Field Mus. No. 736349). San Martin: Zepelacio near Moyobamba, at about 1100 meters altitude, in mountain forest, May 1934, flowers cream-color and violet, *G. Klug 3637*. (Some of the plants of this collection show even smaller stems and leaves than the species, and the flowers are slightly smaller than those described above).

Octomeria complanata *C. Schweinfurth sp. nov.*

Herba parva, caespitosa. Caules numerosi, graciles, complanati, vaginis tubulatis imbricantibus basi ornati. Folium arcuatum, triquetro-subulatum, parvum. Inflorescentiae abbreviatae, plures, uniflorae ut videtur. Sepalum dorsale lanceolato-oblongum vel elliptico-lanceolatum, acutum. Sepala lateralia anguste oblonga vel oblongo-lanceolata, navicularia, subacuta, paulo longiora. Petala oblique oblongo- vel elliptico-lanceolata, sepalis breviora. Labellum arcuatum, parte inferiore lateribus incurvis, prope basim profunde trilobatum, apice rotundatum, basi late rotundatum; lobi laterales parvi, falcati, anguste triangulari-lanceolati; lobus medius multo major, ovatus; discus breviter bicarinatus. Columna generis.

Plant small, with an abbreviated rhizome. Stems caespitose, numerous, slender, complanate, longitudinally striate, up to 8.5 cm. long, monophyllous, provided in the lower portion with three or four imbricating tubular evanescent sheaths which become progressively larger upward. Leaf seemingly a continuation of the stem, triquetrous-subulate, acute, more or less arcuate, up to 4 cm. long. Inflorescences abbreviated, apparently 1-flowered, several in a fascicle. Flowers small, membranaceous, brown-red. Dorsal sepal lanceolate-oblong to elliptic-lanceolate, acute, concave, up to 5.3 mm. long and 1.6 mm. wide, 3-nerved. Lateral sepals narrowly oblong

or oblong-lanceolate, subacute, navicular, up to 6.1 mm. long and 1.1 mm. wide, 3-nerved. Petals obliquely oblong- or elliptic-lanceolate, somewhat shorter than the sepals, up to 4.1 mm. long and 1 mm. wide, acute, 3-nerved. Lip arcuate with the sides of the lower part erect and incurved in natural position, when expanded oblong-ovate, deeply 3-lobed at the base, rounded at the apex, broadly rounded at the base, about 2.1 mm. long; lateral lobes small, narrow, strongly falcate, triangular-lanceolate; mid-lobe many times larger than the lateral lobes, ovate with the margins (especially the posterior ones) irregular, making a sharp sinus with the lateral lobes; disc with a pair of short keels running from the base of the lateral lobes to the lower part of the mid-lobe. Column slender, arcuate, about 1.8 mm. high measured at the back, dilated below and extended into a stout foot.

Octomeria complanata is apparently distinct by reason of its flattened stems. Its floral segments are similar to those of the Bolivian *O. tenuis* Schltr. which is a much larger species throughout. It differs from the Brazilian *O. brachypetala* Schltr. in its much shorter stems, smaller flowers and in the dissimilar apex of the lip.

LORETO: Mishuyacu, near Iquitos, at 100 meters altitude, in forest, October-November 1929, *G. Klug 471*. (TYPE in Herb. Ames No. 60987; DUPLICATE TYPES in U.S. Nat. Herb. No. 1455472 and in Herb. Field Mus. No. 620502).

EXPLANATION OF THE ILLUSTRATIONS

PLATE XVII. PLEUROTHALLIS ECHINOCARPA *C. Schweinf.* 1, plant, one half natural size. 2, flower and ovary, from side, twice natural size. 3, lip from above, natural position, five times natural size. 4, lip from side, natural position, five times natural size. 5, dorsal sepal, twice natural size. 6, lateral sepal, twice natural size. 7, petal, twice natural size.

PLEUROTHALLIS BREVISPICATA *C. Schweinf.* 8, plant, natural size. 9, flower and ovary from side, three times natural size. 10, lip from above, expanded, five times natural size. 11, lip from side, natural position, five times natural size. 12, dorsal sepal, three times natural size. 13, lateral sepals, three times natural size. 14, petal, three times natural size.

PLATE XVIII. PLEUROTHALLIS INAEQUISEPALA *C. Schweinf.* 1, plant, natural size. 2, flower and ovary from side, natural position, five times natural size. 3, dorsal sepal, five times natural size. 4, lateral sepals, natural position, five times natural size. 5, petal, five times natural size. 6, column and lip from side, ten times natural size. 7, lip expanded, ten times natural size.

PLEUROTHALLIS TENUIS *C. Schweinf.* 8, plant, natural size. 9, flower from side, two and one half times natural size. 10, dorsal sepal, five times natural size. 11, lateral sepals, natural position, five times natural size. 12, petal, five times natural size. 13, column and lip from side, ten times natural size. 14, lip from above, expanded, ten times natural size.

PLATE XIX. PLEUROTHALLIS QUADRATA *C. Schweinf.*
1, plant, natural size. 2, flower from front, expanded, ten times natural size. 3, column and lip from side, ten times natural size. 4, lip from above, expanded, ten times natural size.

PLEUROTHALLIS DILATATA *C. Schweinf.* 5, plant, one half natural size. 6, flower and ovary from side, four times natural size. 7, column and lip from side, four times natural size. 8, lip from above, expanded, four times natural size. 9, petal, four times natural size.

PLATE XX. PLEUROTHALLIS LONGISERPENS *C. Schweinf.*
1, plant, natural size. 2, flower from above, expanded, twice natural size. 3, flower and ovary from side, natural position, twice natural size. 4, petal, five times natural size. 5, lip and column from side, natural position, five times natural size. 6, lip from above, expanded, five times natural size. 7, column with anterior horn from side, five times natural size.

PLATE XXI. PLEUROTHALLIS RINGENS *C. Schweinf.*
1, plant, one half natural size. 2, lip and column from side, five times natural size. 3, lip from above, partially expanded, five times natural size. 4, dorsal sepal, two and one half times natural size. 5, lateral sepals, two and one half times natural size. 6, petal, five times natural size.

PLATE XXII. PLEUROTHALLIS SPATHULIFOLIA *C. Schweinf.*
1, plant, one and one half times natural size. 2, flower from above, expanded, five times natural size. 3, column and lip from side, ten times natural size. 4, lip from above, twenty times natural size.

PLEUROTHALLIS CAUDATIPETALA *C. Schweinf.* 5, plant, two and one half times natural size. 6, flower from above, expanded, five times natural size. 7, lip from above, expanded, twenty times natural size. 8, column and lip from side, ten times natural size.

PLATE XXIII. PLEUROTHALLIS VARGASII *C. Schweinf.*
1, plant, one half natural size. 2, flower and ovary from side, five times natural size. 3, column and lip from side, five times natural size. 4, lip from above, five times natural size. 5, petal, five times natural size. 6, dorsal sepal, five times natural size. 7, lateral sepals, expanded, five times natural size.

PLATE XXIV. OCTOMERIA COMPLANATA *C. Schweinf.*
1, plant, natural size. 2, flower and ovary from side, five times natural size. 3, flower from above, expanded, five times natural size. 4, lip from above, expanded, ten times natural size. 5, column and lip from side, ten times natural size.

PLATE XVII

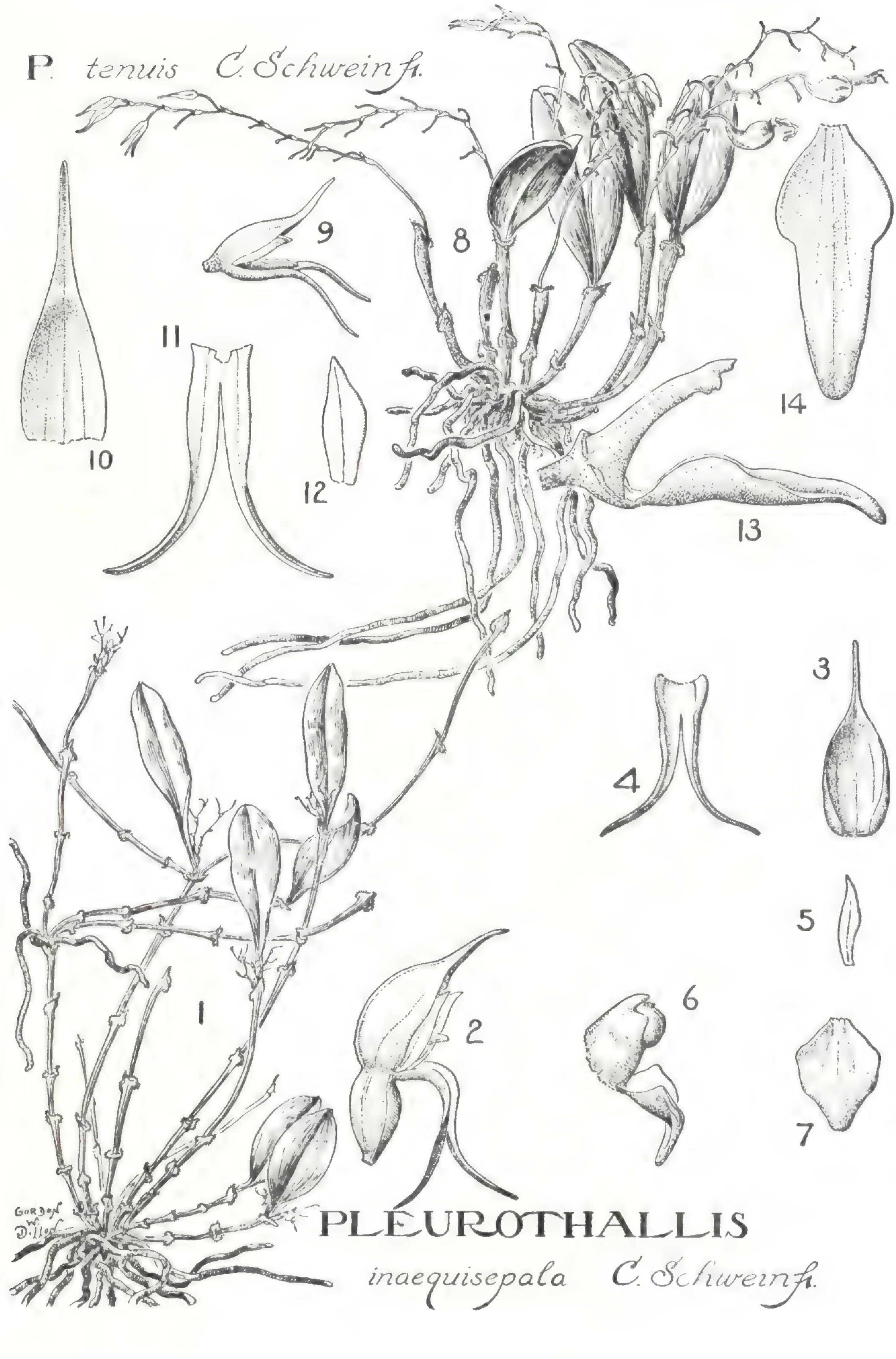
PLEUROTHALLIS

echinocarpa *C. Schweinf.*

P. *brevispicata* *C. Schweinf.*

Plate XVIII

P. *tenuis* *C. Schweinfi.*



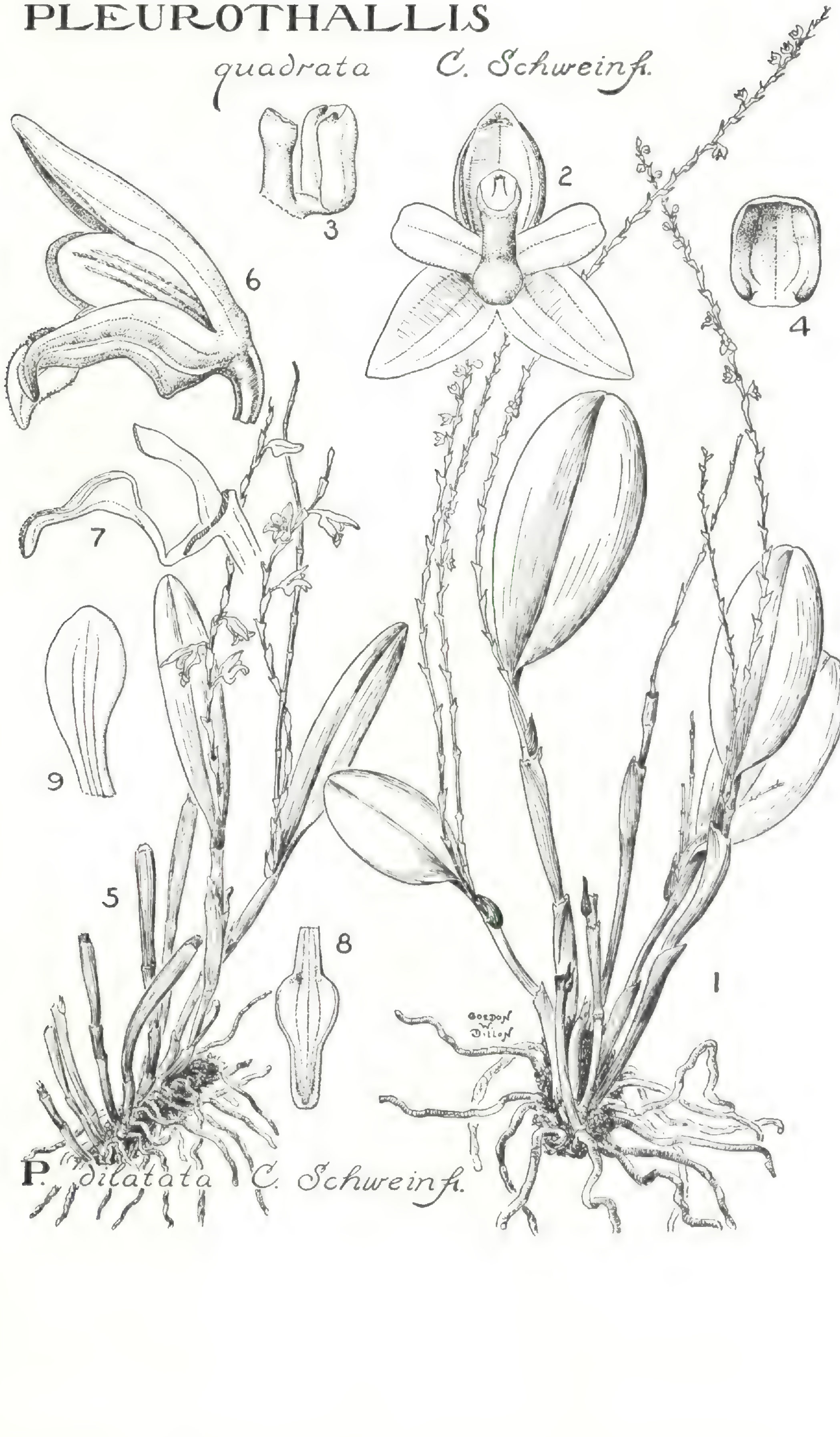
PLEUROTHALLIS

inaequisepala *C. Schweinfi.*

PLATE XIX

PLEUROTHALLIS

quadrata *C. Schweinfk.*



P. *dilatata* *C. Schweinfk.*

PLATE XX

PLEUROTHALLIS

longiserpens C. Schweinf.

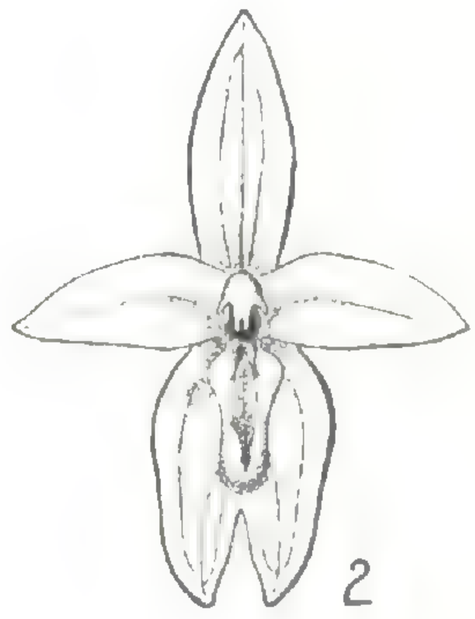
PLATE XXI

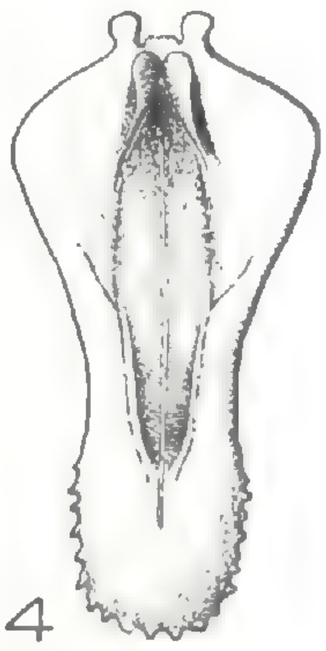
PLEUROTHALLIS

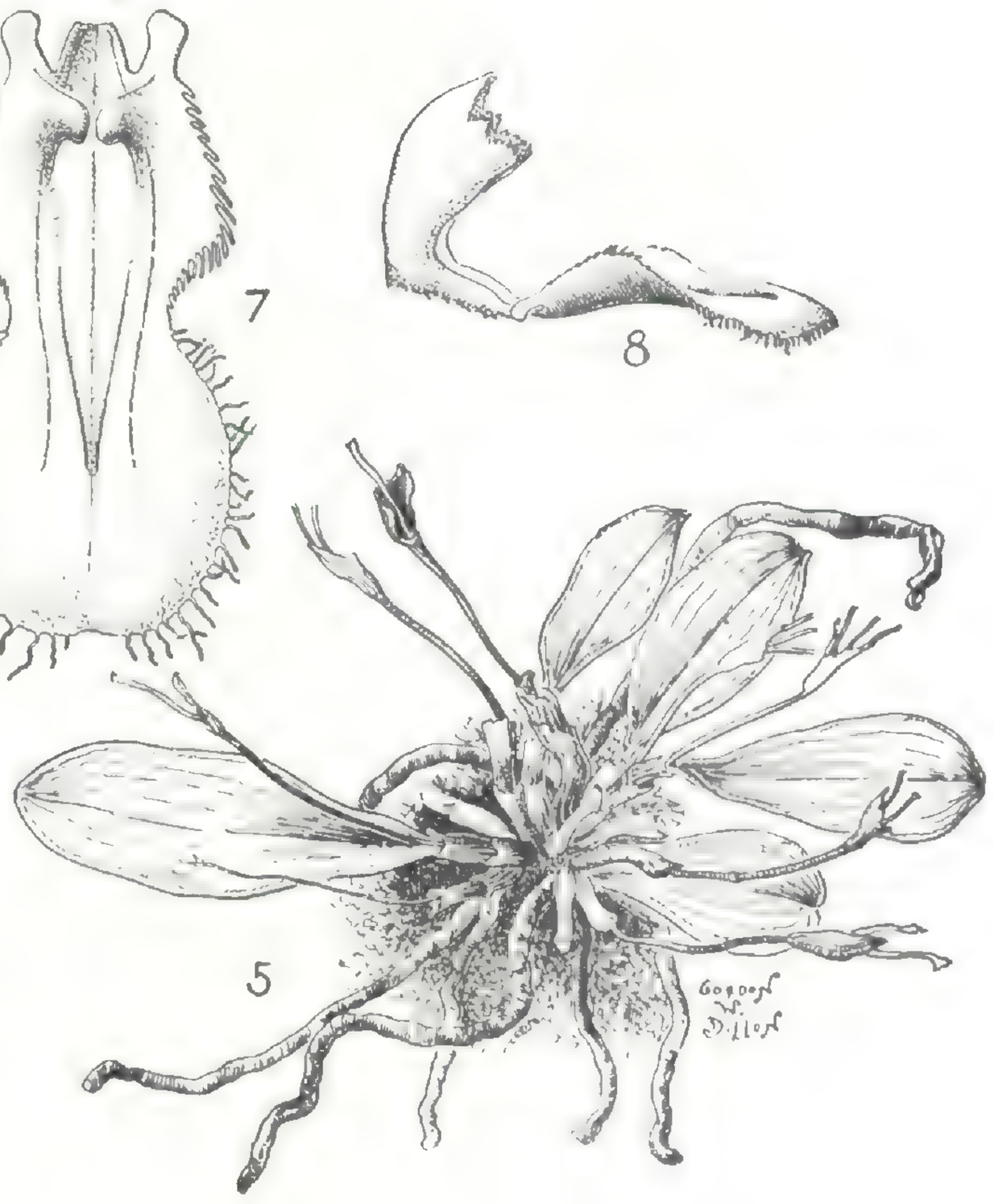
ringens C. Schweinfi.

PLEUROTHALLIS

spathulifolia C. Schweinf.







P. caudatipetala C. Schweinf.

Plate XXIII

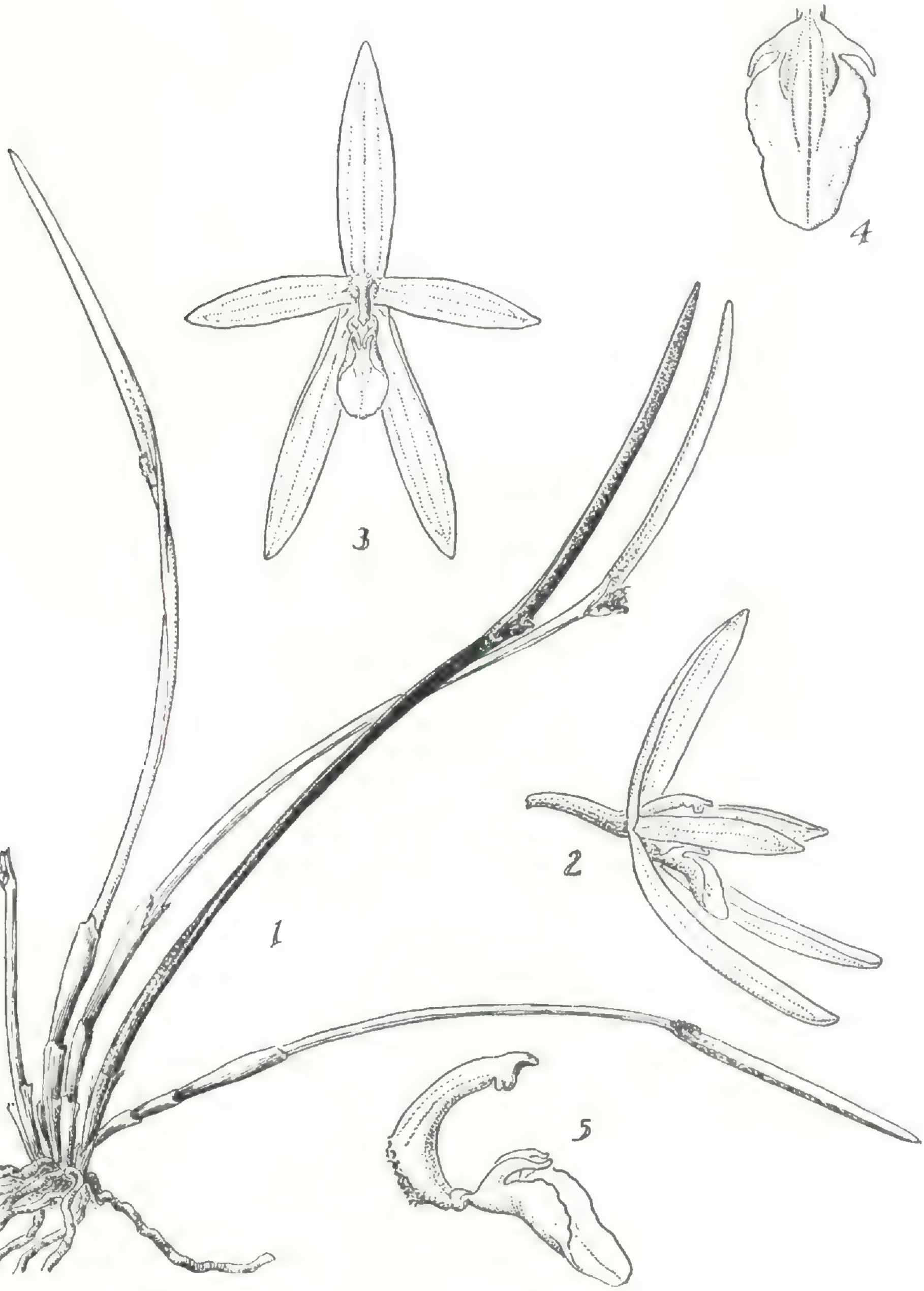
PLEUROTHALLIS

Vargasii C. Schweinfl.

PLATE XXIV

OCTOMERIA

complanata C. Schweinf.



BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, AUGUST 21, 1942 VOL. 10, NO. 8

WESTERN GUATEMALA A SECONDARY CENTER OF ORIGIN OF CULTIVATED MAIZE VARIETIES[1]

BY

PAUL C. MANGELSDORF AND JAMES W. CAMERON

IN A PREVIOUS PUBLICATION Mangelsdorf and Reeves (18) advanced the tripartite hypothesis: 1. that cultivated maize originated from a wild form of pod corn which was once, and perhaps still is, indigenous to the lowlands of South America; 2. that Euchlaena (teosinte), the closest relative of maize, is a recent product of the natural hybridization of *Zea* and Tripsacum which occurred after cultivated maize had been introduced by man into Central America; 3. that new types of maize originating directly or indirectly from this cross and exhibiting admixture with Tripsacum comprise the majority of Central and North American varieties.

The three parts of this hypothesis, although presenting an integrated picture of the origin of maize, are nonetheless to some extent independent of each other. The actual discovery of wild pod maize, for example, while completely establishing the first postulate, would do no more than lend strong indirect support to the second and third. Overwhelming evidence that teosinte is a hybrid of maize and Tripsacum would not prove that the majority

[1] The investigations reported in this paper were financed in part by a grant from the Massachusetts Society for Promoting Agriculture. The authors desire to express their sincere appreciation of this support.

HARVARD UNIVERSITY

of Central and North American varieties are contaminated with Tripsacum. It becomes necessary therefore to attack separately the numerous problems which are suggested by each of the three more or less independent parts of the hypothesis. This paper concerns itself only with the third. How extensive has been the introgression of Tripsacum into maize to produce new types and where is the region—the secondary center of origin of cultivated maize varieties—in which this phenomenon has occurred?

In approaching this problem the conclusions of Mangelsdorf and Reeves are utilized as the working hypothesis and the results obtained are discussed in terms of that hypothesis. Other interpretations can be made, however, and are discussed later.

In the previous publication it was pointed out that in the number and position of chromosome knobs, teosinte, as it is in many other characteristics, is intermediate between North American maize and Tripsacum.[2] This fact suggested that pure maize, uncontaminated by Tripsacum, might possess knobless chromosomes. Such varieties were sought and found in the Andean region of Peru, Bolivia and Ecuador. It was also found that these varieties differ from the majority of those of North and Central America in lacking characteristics which might have been derived from Tripsacum. The Andean varieties are, to use a term proposed by Anderson and Erickson (1), much less "Tripsacoid" than the predominating maize of Central or North America.

Another corollary of this same line of reasoning is

[2] Chromosome knobs are deeply-staining pycnotic enlargements visible at high magnifications when the chromosomes are in the pachytene stage. They have been observed only in the three American Maydeae: Tripsacum, Euchlaena and Zea. In Tripsacum and Guatemalan teosinte they are numerous and are confined to the ends of the chromosomes. In maize and Mexican teosintes their number is variable and their position frequently subterminal.

that we should expect to find the most Tripsacoid maize, maize with the largest number of chromosome knobs, in the general region where teosinte occurs most abundantly as a plant growing in the wild, the region where it presumably originated from the hybridization of maize and Tripsacum. We might, however, also have a reasonable expectation of finding in this same general region non-Tripsacoid varieties, descendants of the pure maize which had been introduced from South America and which had been the only type grown before the hybridization with Tripsacum occurred.

Since western Guatemala is the only region so far discovered where teosinte grows in profusion in a wild state, since it is a region where Tripsacum is common, and finally since it is a region of numerous mountains and valleys—natural barriers which would enable varieties once established to maintain themselves indefinitely in a relative state of genic stability—it appeared to be the most promising region for beginning an investigation of this problem.

At our instigation Dr. F. W. McBryde, Department of Geography, Ohio State University, who spent more than a year in Guatemala and southern Mexico as National Research Council Fellow, has made comprehensive collections of maize varieties in these regions. His collection from western Guatemala was especially complete including 318 ears from thirty-eight localities in thirteen Departments. We are also indebted to Dr. McBryde for various data on the corn varieties and the localities where they were collected.

Even a cursory study of this collection demonstrates at once the great diversity of maize in western Guatemala. Here, in an area less than half the size of the state of Iowa, are found probably more distinct types of corn than occur in the entire United States.

Plants from 200 ears of this collection were grown in duplicate plantings at New Haven, Connecticut,[3] and Forest Hills, Massachusetts, in the summer of 1941. The remaining 118 ears were omitted partly because of limitations of time and space but mainly because they appeared to be duplicates or near-duplicates of those selected for planting from the same locality. The great majority of the varieties were tall-growing, vigorous and late in maturity. In spite of an unusually favorable season and absence of early frost, not all varieties reached a stage where material for cytological studies could be collected and only 162 were examined cytologically. To this extent our sampling of Guatemalan maize is not completely random because the more Tripsacoid varieties, those with largest numbers of chromosome knobs, are among the later maturing ones.

Again, because of the limitations of time, knob number was determined on only one plant in each variety. This admittedly is not an adequate sample for establishing the average knob number of a variety. The primary goal in this case, however, was to sample the region rather than the variety. In considering relationships, discussed later, between knob numbers and other characteristics, it should be borne in mind that significant relationship can be shown in spite of rather than because of inadequate sampling of varieties. Had the average knob numbers for each variety been more precisely determined, even more significant relationship could probably have been shown.

No attempt was made to identify each chromosome on which a knob was borne nor to determine the position of each knob but in examining the preparations all of the eighteen knob positions which Longley (14) has described

[3] We are indebted to Dr. D. F. Jones and other members of the staff of the Connecticut Agricultural Experiment Station for invaluable assistance in connection with the studies made at New Haven.

TABLE I

Knob numbers of maize varieties from Guatemala

Department	Locality	Number of Varieties	Range of Knob Nos.	Average Knob No.
Quezaltenango	Almolonga	3	4–6	4.7
"	Cantel	5	4–6	4.8
"	San Juan Ostuncalco	17	3–8	4.9
"	San Martin Sacatepequez	5	4–6	5.6
"	Olintepeque	12	3–9	6.2
"	Quezaltenango	2	6–8	7.0
	Total and Average	44	3–9	5.4
Totonicapan	San Francisco el Alto	4	4–6	5.2
"	San Cristóbal Totonicapan	4	3–10	5.5
"	Momostenango	3	9–12	10.7
	Total and Average	11	3–12	6.8
El Quiche	Santo Tomás Chichicastenango	9	5–9	7.0
"	San Pedro Jocopilas	11	3–12	7.9
	Total and Average	20	3–12	7.5
Huehuetenango	Santa Eulalia	4	1–6	4.0
"	San Juan Atitan	4	1–9	4.8
"	San Juan Ixcoy	6	3–8	5.2
"	San Sebastián Coatán	6	1–11	6.0
"	San Martin Cuchumatán	4	4–11	8.5
"	Huehuetenango	6	6–14	8.7
"	Todos Santos Cuchumatán	2	4–14	9.0
"	Chalchitan	5	5–11	9.8
"	San Miguel Acatan	1	11	11.0
"	Jacaltenango	2	11–12	11.5
"	San Antonio Huista	7	9–14	12.4
"	Santiago Petatán	1	14	14.0
	Total and Average	48	1–14	8.1
Chimaltenango	Tecpam	4	7–11	9.5
Baja Verapaz	Rabinal	7	6–12	9.6
Suchitepequez	Chicacao	1	10	10.0
Solola	San Lucas Tolimán	1	9	9.0
"	Santa Catarina Palopó	1	10	10.0
"	Panajachel	4	8–13	10.8
	Total and Average	6	8–13	10.4
Jalapa	San Pedro Pinula	4	7–10	8.2
"	San Luis Jilotepeque	2	12–16	14.0
"	Cruz de Villeda	1	15	15.0
	Total and Average	7	7–16	10.8
Guatemala	Chinautla	1	11	11.0
Retalhuleu	San Sebastián Retalhuleu	4	11–14	12.2
Escuintla	Puerto San José	3	11–14	12.3
"	San Lucia Cotzumalguapa	3	10–15	12.3
	Total and Average	6	10–15	12.3
Chiquimula	Quezaltepeque	1	12	12.0
"	Camotán	2	13–16	14.5
	Total and Average	3	12–16	13.7
	Grand Total and Average	162	1–16	7.9

in maize were encountered at least once. In addition three positions not previously reported, two on the long arm of the tenth and another terminating the short arm of the first chromosome, were seen bearing enough pycnotic material to require their being classed as knobs.

Table I shows the departments and localities from which the varieties were collected; the range in knob numbers and average knob numbers. The thirty-eight localities and their average knob numbers are also shown in the accompanying map.

The average knob number for the 162 varieties is 7.9, the highest average number so far reported for any country or region studied. Even without further analysis this bears out the assumption that the highest knob numbers should occur in the general region where teosinte is most abundant in the wild state.

The second and somewhat contradictory assumption that varieties with knobless chromosomes might also be encountered in this same general region has not been completely met, although it has been closely approached. Three varieties were found with only one knob and it is reasonable to suppose that knobless plants would have been discovered in these or other varieties had additional studies been possible. Indeed Dr. R. G. Reeves, working with other samples from Guatemala, has found one variety segregating for knobless plants.

Of particular interest is the knob situation in the Department of Huehuetenango. In a small area of less than two hundred square miles, approximately the area bounded by a polygon in which the points are formed by the localities of San Antonio Huista, Santiago Petatán, San Martin Cuchumatán, Todos Santos Cuchumatán, San Juan Ixcoy, Santa Eulalia, San Sebastian Coatán, San Miguel Acatan and Jacaltenango, are found knob numbers ranging from one to fourteen. Here in an area scarce-

ly larger than that of New York City are found almost all the knob positions known in maize from any part of the world. Here too are the localities where Kempton and Popenoe (9) found teosinte occurring as the dominant species over thousands of acres,[4] the only place so far discovered where this condition exists, and where they also found a species of Tripsacum growing in great profusion. Here then are all the elements to make the picture complete: Andean types of corn almost completely lacking in chromosome knobs, slightly contaminated descendants of the pure corn introduced from South America; Tripsacum growing in profusion on the hillsides and furnishing the opportunity for natural hybridization; the most Tripsacoid type of Euchlaena known, presumably the primary product of the hybridization of Zea and Tripsacum, occupying thousands of acres as the dominant species, and finally Tripsacoid maize varieties, secondary products of the hybridization, showing all degrees of admixture with Tripsacum.

Here then, if diversity is any criterion whatever, is certainly a well-defined center of origin of cultivated maize. According to the hypothesis of Mangelsdorf and Reeves this is the secondary center of origin, the place where new types have come into existence as the result of hybridization of maize and Tripsacum. According to older hypotheses which have maize deriving directly from teosinte, or all three of the American Maydeae, maize, teosinte and Tripsacum deriving from a common ancestor, this is the primary center of origin of cultivated maize. In any event it is obviously a concentrated center of diversity not only in the external morphological characteristics of the ears

[4] Teosinte in this area is even more common than the observations of Kempton and Popenoe indicate, since McBryde has found it growing in great abundance between Santiago Petatán and Santa Ana Huista, a locality about four miles west of San Antonio Huista.

but also in certain internal morphological features of the chromosomes.

Varieties with still higher knob numbers, numbers up to sixteen, were found in other parts of Guatemala. No particular significance attaches to this, however, for the sampling errors are large and it is reasonable to assume that plants with as many as sixteen or more knobs would be discovered in this area if an exhaustive search were made. This is especially probable since some of the most Tripsacoid varieties from this area, being very late in maturity, were not examined cytologically. Of the twenty-one varieties planted from the four localities in Huehuetenango with highest knob numbers, only eleven were early enough for cytological examination.

Knob number is only one of the characteristics by which the degree of contamination with Tripsacum can be measured. It is perhaps one of the most useful because it is a precise quantitative datum. We assume that the chromosome knobs of present-day corn were derived from Tripsacum through teosinte and on that assumption the number of knobs becomes a rough measure of the amount of Tripsacum admixture. It is desirable, however, to test this assumption by determining whether knob number is associated with other characteristics which might have been derived from Tripsacum.

That there is such a relationship can be immediately discerned even without studying other characteristics in detail. When ears of these varieties were received from Dr. McBryde it was at once apparent that some of them resembled quite closely certain varieties from the Andean region. These were tentatively designated as "Andean" types. The average knob number of this group, comprising sixteen varieties, is 4.7, only slightly more than half the average number 7.9 for the population as a whole. In other words it was possible on the basis of the general

appearance of the ears alone to sort out varieties which later proved to have low knob numbers.

More detailed studies, the results of which are set forth in Table II, show that knob number is associated with many other characteristics. Before considering these relationships it should be explained how they are determined. Since the data are not extensive in a statistical sense and in some cases represent qualitative rather than quantitative scoring, elaborate statistical treatment is not indicated and in some instances not feasible. P values, which are a measure of significance, were derived from Chi square values, computed from fourfold tables in which the population was arbitrarily divided into two groups on the basis of knob numbers and into two additional groups on the basis of the other character under consideration. In several cases where additional refinement seemed desirable the second division involved three categories instead of two.

In quantitative characters other than knobs, separation was made at the mean and the two groups were approximately of equal size. In the case of knob numbers, however, it was found by examination of the data and preliminary computations that a more natural grouping could be made if varieties with six knobs or less were included in the low-knob group, varieties with seven knobs or more in the high-knob group. P values are only slightly higher however, and in several instances lower, if the separation is made at the mean.

Relationships between knob numbers and other characteristics

Altitude

Adaptation to altitude may well be one of the characteristics involved in the introgression of Tripsacum into maize. At any rate there is an obvious relationship be-

TABLE II. The relationship between knob number and other characters in maize from Guatemala

No. Knobs	1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Weighted Averages		x^2	P
No. Varieties*	3	10	18	14	23	16	10	13	7	19	14	4	7	2	2	Low	High		
Av. Altitude where collected (ft.)	7928	7954	7836	7672	7557	6458	7216	6622	5973	4904	3877	4920	4169	2050	2460	7729	5417	43.37	<.01
Av. Length of Ear (cm.)	16.7	14.8	17.2	16.9	17.2	17.6	17.9	19.1	20.1	19.4	16.2	18.2	18.3	18.5	11.5	16.8	18.1	2.15	>.05
Av. Diameter, Base of Ear (mm.)	56.7	48.8	51.8	50.0	50.0	47.7	50.0	48.8	52.1	48.4	47.9	50.0	49.3	47.5	40.0	50.6	48.7	0.24	>.05
Av. Diameter, Tip of Ear (mm.)	28.3	30.6	30.6	31.4	32.3	32.7	33.0	31.9	35.0	32.1	36.8	35.0	35.0	37.5	32.5	31.3	33.7	4.88	.04
Tip/Base Index	49.9	62.7	59.1	62.8	64.6	68.6	66.0	65.4	67.2	66.3	76.8	70.0	71.0	78.9	81.2	61.8	69.3	8.59	<.01
Tapering Index	2.99	2.52	2.38	2.20	2.06	1.78	1.90	1.81	1.63	1.74	1.43	1.65	1.58	1.14	1.63	2.28	1.69	14.96	<.01
Av. No. Rows of Grain	16.7	13.8	11.4	11.9	12.5	12.7	12.2	12.6	14.6	12.5	12.9	13.5	13.4	13.0	13.0	12.4	12.9	1.17	>.05
Ratio of Irregular to Distinct Rows	3:0	10:0	16:2	10:4	14:9	6:10	3:7	1:12	1:6	4:15	3:11	0:4	2:5	0:2	0:2	53:15	20:74	51.38	<.01
Ratio of Yielding to Firm Cobs	3:0	6:4	11:7	8:6	13:10	5:11	5:5	8:5	3:4	8:11	7:7	2:2	3:4	1:1	2:0	41:27	44:50	2.86	>.05
Av. No. Seeds per Row	24.7	27.3	29.2	28.5	29.7	32.3	34.5	33.0	38.3	37.5	38.1	35.0	35.4	43.0	28.5	28.8	35.5	21.83	<.01
Av. No. Seeds per Cm.	1.48	1.84	1.70	1.68	1.73	1.83	1.93	1.73	1.90	1.94	2.35	1.92	1.94	2.32	2.48	1.72	1.97	8.59	<.01
Av. Wt. of 10 Seeds (gms.)	4.5	3.8	4.8	4.6	4.0	3.7	3.7	3.8	3.3	3.4	3.0	3.4	3.0	3.0	2.0	4.3	3.4	16.40	<.01
Ratio of Flint and Flour to Dent Grains	3:0	7:3	14:4	12:2	15:8	13:3	8:2	10:3	3:4	9:10	3:11	1:3	2:5	0:2	0:2	51:17	49:45	8.95	<.01
Ratio of Presence to Absence of Endosperm Color	3:0	8:2	11:7	10:4	14:9	7:9	2:8	8:5	2:5	12:7	5:9	4:0	2:5	0:2	0:2	46:22	42:52	8.46	<.01
Ratio of Presence to Absence of Purple Plant Color	0:3	0:10	0:18	0:14	1:22	1:15	0:10	0:13	2:5	3:16	2:12	1:3	2:5	1:1	0:2	1:67	12:82	6.94	<.01
Ratio of Coarse and Intermediate to Fibrous Roots	3:0	10:0	18:0	11:3	21:2	11:5	7:3	13:0	6:1	14:5	5:9	1:3	0:6	1:1	0:2	63:5	58:35	19.31	<.01
Ratio of Strong to Medium and Zero Pubescence	2:1	10:0	14:4	10:4	19:4	11:5	7:3	4:9	2:5	4:15	1:13	0:4	0:7	0:2	0:2	55:13	29:65	39.39	<.01
Av. Percentage of Smutted Plants	71.9	53.6	52.1	52.3	58.4	33.9	30.0	42.4	22.4	33.1	38.0	44.0	30.3	48.8	65.0	55.4	35.4	8.78	<.01
Av. Percentage of Lodged Plants	67.4	78.3	67.5	66.4	70.3	44.2	52.6	49.1	36.6	41.3	28.5	16.9	26.3	23.8	5.0	69.8	38.5	32.85	<.01

* Five varieties with branched ears omitted in measurements on ear diameters and tapering.

tween altitude and knob number. Precise data on altitudes of the thirty-eight localities included in this study are not available but approximate altitudes were determined from a topographical map prepared by Dr. McBryde from original surveys and other sources. In spite of the lack of precise data there is a highly significant relationship (P is less than .01) between number of knobs and altitude of the locality from which the maize was collected. Maize with one or three knobs was collected at altitudes averaging approximately 8000 feet. Maize with fifteen or sixteen knobs was collected at altitudes averaging 2000–2500 feet. Intervening values show approximately a linear relationship.

We interpret this relationship to mean that the non-Tripsacoid or Andean type of maize introduced from South America was then, as it is now, poorly adapted to culture at low altitudes. If it was grown at all at low altitudes, it was immediately replaced by Tripsacoid maize as soon as the latter had come into existence. At high altitudes, however, the pure maize has been able to hold its own. A similar situation has already been reported for South America where knobless types predominate in the Andean regions of Peru, Bolivia and Ecuador, while Tripsacoid types with knobby chromosomes are most frequent in the lowlands. There is some indication that Tripsacoid maize can succeed and is to some extent replacing non-Tripsacoid maize even at high altitudes. Of the sixty-eight varieties with six knobs or less, only two are found at an altitude lower than 6500 feet; while varieties with twelve knobs or more are frequently encountered at approximately 5000 feet and occasionally at 6500 feet and higher.

The fact that non-Tripsacoid varieties of maize are found only at high altitudes in Guatemala is not necessarily in conflict with the assumption, previously men-

tioned, that the wild progenitor of maize was a lowland plant. Whatever may have been the nature of the original wild maize, it has given rise under domestication to varieties differing widely in their adaptation. Those introduced into Guatemala were apparently high-altitude varieties; at any rate only varieties adapted to high altitudes have survived the encroachment of the Tripsacoid types.

The importance of differences in altitude as natural barriers to promiscuous hybridization is emphasized by the situation in Huehuetenango. Here maize varieties with extremely low knob numbers, the lowest encountered in Guatemala, are found in Santa Eulalia while only eleven and fifteen miles away, at Jacaltenango and San Antonio Huista respectively, are found maize varieties with extremely high knob numbers. These localities though not far apart in distance are separated by more than 3000 feet in altitude. To one who has traveled in Guatemala and been transported from the steaming tropics near sea level to chilly mountain passes above the clouds in a distance of twenty-five miles by road, the effectiveness of this barrier is not difficult to appreciate, especially when it is associated, as it is in many cases in Guatemala, with actual physical barriers.

Size and shape of ear

No more than a casual inspection is required to show that in this collection, number of knobs is associated with size and shape of ears. Among the varieties with low-knob numbers are many ears with a pyramidal shape, the diameter at the butt larger than at the tip. Among varieties with high knob numbers the majority are almost cylindrical in shape. There is reason to expect such an association for in hybrids of maize and teosinte many of the segregates are more nearly cylindrical than the maize

parents, suggesting that Tripsacum germplasm produces effects in this direction. There is also reason to expect number of knobs to be associated with length of ear, for the C segment from teosinte increases the length of the ear in segregates from crosses of maize and teosinte. However, this occurs only when the C segment is acting alone. When other segments are present the ears are shorter.

No significant difference between low and high groups is shown in average length of ear on the basis of a four-fold table. There are some extremely long ears in the collection, however, and these are confined to varieties with intermediate knob numbers. None is found in the group with very low or very high knob numbers.

The groups do not differ significantly in diameter at base of ear and the difference in diameter at tip of ear is barely significant. There is a highly significant difference in the tip-base index which is derived by dividing diameter at tip by diameter at base. This tendency for the low-knob group to have tapering ears is shown still more strikingly in the taper index which expresses as a percentage the amount of reduction in diameter which occurs in each centimeter unit of length. Taper index is derived by dividing by length, the percentage difference between diameters at base and tip. The relationship between knob number and taper index is approximately linear.

Number and regularity of the rows

Another effect which Tripsacum germplasm produces in hybrids of maize and teosinte is a reduction in the number of rows of grain and a straightening of the rows. We might therefore expect both of these characters to be associated with knob numbers. The second expectation has been met but the first has not. The difference in the average number of rows in the low-knob and high-

knob groups is very small and is not significant. There is a highly significant difference, however, between knob numbers and regularity of rows. The population had originally been divided into three groups on the basis of this characteristic, the first in which the rows were so indistinct that their number was difficult to determine; the second in which the rows were irregular but still readily discernible; the third in which the rows were distinct and straight. For purposes of computation, the first two groups were combined. In spite of this loss of refinement there is a highly significant relationship with knob number. The Chi square computed from a fourfold table is 51.4, the highest value encountered in any of the relationships studied. It was probably this character, more than any other, which was unconciously taken into consideration in classifying some of the ears as "Andean," for it is a fact that ears of the Andean region usually exhibit decidedly irregular rows of grain.

Firmness of the cob

Associated with a cylindrical ear and straight rows of grain is a hard, stiff cob holding the grains so firmly that they do not yield when pressure is applied with the thumb. In ears of many Andean varieties the kernels are easily pushed into the cob. Dr. Hugh C. Cutler who has travelled extensively in Guatemala tells us that the Indians are familiar with this characteristic and that in certain regions they discriminate against ears in which the kernels yield to pressure.

There is a relationship between this characteristic and knob number. When Chi square is computed from a fourfold table, the relationship does not appear to be significant, but when the ears are divided into three categories instead of two on the basis of firmness of the cob, a significant relationship can be shown.

It is not clear precisely what is represented by the firmness of the cob but it probably expresses at least two separate factors—the strength of the stalk to which the base of the caryopsis is attached and the rigidity of the glumes. The firmness of the cob is associated also with resistance to shattering. Ears of the Andean types usually shatter easily while some of the more Tripsacoid varieties and segregates from maize-teosinte crosses can be shelled only with difficulty. Tripsacum seems to impart to its derivatives a decided coriaceous quality which affects all parts of the cob and, indeed, practically all parts of the plant.

Size and shape of seeds

Tripsacum seeds are quite small and it would be expected that size of seed in maize would decrease with the amount of Tripsacum admixture. This has proved to be the case. Three measurements, number of seeds per row, number of seeds per unit (one cm.) of row and weight of ten seeds, all concerned with the size, and, to some extent, with the shape of the seed, show highly significant differences between the low and high groups. The greatest difference is shown in weight of seed which suggests that shape is a minor factor, as it is not involved in weight. There is little doubt, however, though it has not been demonstrated statistically, that differences in shape are also associated with knob number. We have not succeeded in devising any simple method of measuring the differences in shape though it is apparent that they exist. Among the low-knob group for example, are found ears of the Andean type in which the caryopses frequently approach a spherical shape and in which there is a considerable variation in size. These characteristics, combined with the irregularity in rows and the short tapering ear, make the entire structure comparable to a compact bunch of grapes. In the high-knob group, on the other

hand, the extreme type is one in which the grains are flat, uniform in size and shape and very regularly spaced in straight rows.

Endosperm type

It was suggested by Mangelsdorf and Reeves (18) that the pointed-seeded pop corns of Mexico and Central America are the most Tripsacoid types which have resulted from admixture with Tripsacum and that dent types originated from hybridization of these with uncontaminated flour corn. The Guatemalan varieties do not support this suggestion. Among the high-knob group, especially among varieties with ten knobs or more, dent corn is the predominating type. No pointed pop corns were included in McBryde's collection, although varieties with decidedly pointed seed occur. It is possible that the pointed-seed pop varieties are still to be collected in Guatemala but it is also possible that the original assumption that they are the most Tripsacoid types is in error. It is obvious now that such an assumption is not required inasmuch as Tripsacum and teosinte are themselves popping cereals (Beadle (4); Mangelsdorf and Reeves, unpublished), and there is no reason why a hybrid of teosinte and flour corn should not give rise directly to dent types. Such hybrids are now being investigated.

In the meantime it is clear that there is a relationship (P is less than .01) between knob number and dent types as opposed to typical flint or flour types. The two latter types are combined for purposes of computation. They differ from each other primarily by a single gene and there are several examples in our collection, of ears almost identical in all characteristics except that one is flinty, the other floury. Denting, on the other hand, is governed by a number of genes and is a complex departure from the basic flint and flour types.

Plant colors

There is no reason to expect a relationship between knob numbers and the various plant colors; all are encountered frequently in both Andean and Tripsacoid types of maize. No relationship was found between knob number and pericarp color, aleurone color or cob color, and the data are not included in Table II. Highly significant relationships were found, however, between knob number and endosperm color and knob number and purple plant color. Varieties with yellow endosperm predominate in the low-knob group, varieties with white endosperm in the high-knob group. What this means, if anything, in terms of Tripsacum contamination is difficult to see. It might suggest that the greater the amount of Tripsacum admixture the more likely is the *y* allele from Tripsacum to be included, but this suggestion does not appear especially plausible when alleles involved in other plant colors are not so affected. Indeed in the case of purple plant color, the gene for which presumably derives from maize, the relationship is reversed. Here the proportion of purple plants is significantly greater in the high-knob than in the low-knob group even when allowance is made for the low frequency in which purple plants appear. The reason for the relationship between these two plant colors and knob number is not clear.

Nature of the seminal root system

Seedlings of Andean type maize and of the infrequently knobbed Guarani maize of Paraguay are characterized by coarse, vigorous, primary and secondary seminal roots possessing a relatively small number of tertiary roots. Seedlings of Tripsacum, teosinte and strongly Tripsacoid maize have more fibrous root systems; the primary roots are slender and thread-like, the tertiary roots abundant. The two extreme types of root systems

may be conveniently designated as coarse and fibrous.

There is a highly significant relationship between knob number and the nature of the seminal root system. The relationship is closer than the data in Table II indicate, since varieties with intermediate knob numbers tend to have intermediate root systems, a fact which is not revealed when only two categories with respect to each characteristic are utilized.

Pubescence of sheaths

Many of the Guatemalan varieties exhibit highly pubescent leaf-sheaths and this characteristic is almost universal in the maize varieties of the central plateau of Mexico. We have encountered no South American varieties with knobless chromosomes in which this character occurs, and since at least one species of Tripsacum, *T. pilosum* Scribn. & Merr., is highly pubescent we might infer that this character, when it occurs in maize, has been derived from Tripsacum. Dr. Cutler, on the basis of his extensive observations and collections in Mexico and Guatemala, is of the opinion, however, that pubescence is a maize character and that at least part of the pubescence in Tripsacum is the result of the introgression of maize into Tripsacum. There is no doubt that some species of Tripsacum are heterozygous for pubescence. The senior author has found near Guadalajara, Mexico, pubescent and glabrous plants, apparently of the same species, growing in the same colony.

But, whatever may have been its origin in Tripsacum, pubescence, in Guatemalan maize, is undoubtedly a character derived from maize. The teosinte of San Antonio Huista is glabrous, and apparently the Tripsacum which grows in this area is also glabrous, for Kempton and Popenoe (9) describe it as "probably *T. laxum*," a species, which so far as we know, is always glabrous.

Furthermore there is a highly significant relationship between knob numbers and pubescence, pubescence being associated with low-knob numbers, smoothness with high numbers. The relationship is so strong and clear-cut that it allows us to make the prediction that knobless varieties of maize with pubescent leaf-sheaths will be discovered in South America when a thorough search is made.

Hairy sheath in maize has been reported as a simple Mendelian dominant by Tavcar (21). It may behave this way in certain cultures, when, for example, knobless pubescent stocks are crossed with knobless glabrous stocks. Among the Guatemalan varieties, however, its presence or absence is related to the number of knobs. All varieties with three knobs or less were strongly pubescent, all varieties with five knobs or less were pubescent to some degree. Among varieties with eight knobs or less only four in ninety-four were glabrous. In contrast, among varieties with twelve knobs or more only one in twenty-nine was pubescent and all varieties with thirteen knobs or more were glabrous. In this particular population a minimum of six knobs and usually eight or nine knobs are required to suppress pubescence, while the presence of twelve or more practically eliminates pubescence.

Pubescence, if it does not prove to be too widely distributed among South American varieties, may enable us to determine the region from which the Andean types of maize were introduced into Central America, for all of the Andean types so far discovered in this region are pubescent.

Smut infection

The planting at Forest Hills was made on a piece of land which had been heavily manured. As a consequence infection with smut, *Ustilago Zeae* (Beckm.) Ung., was extremely severe. The data in Table II show that there

is a highly significant negative relationship between knob number and percentage of plants infected with smut. Since Tripsacum has never been reported as a host for this organism and is apparently not susceptible to this disease, the relationship between knob number and resistance to smut is presumably due to the genes for resistance introduced from Tripsacum with the knobs.

Here, as in the case of altitude and pubescence, the low-knob group is comparatively uniform. All varieties with six knobs or less were infected by smut, every plant in some cases being severely infected. Varieties completely free of smut are encountered only among those with seven knobs or more. However, among varieties with as many as twelve knobs or more, are several which are strongly susceptible to smut; while Florida teosinte, with even more knobs than the most Tripsacoid maize, exhibits marked susceptibility under certain conditions. The relationship between knob number and smut resistance is obviously not a simple one.

Lodging

At both New Haven and Forest Hills many varieties were completely lodged. The stalks of some of these were so brittle that they snapped at the slightest tension; other varieties stood erect throughout the entire season despite a severe storm. These differences are strongly associated with knob number, the percentage of lodged plants decreasing progressively as the number of knobs increases. Here again, however, the low-knob group is reasonably uniform. Among varieties with six knobs or less only two had all of their plants erect at the end of the season, while about half of the varieties in this group had all plants prostrate and tangled.

Differences in lodging are associated with the internal structure of the stalk. Varieties with tender, brittle stalks

have practically no rind and the vascular bundles are widely scattered. At the other extreme are varieties with stalk so tough and strong that it is almost impossible to cut them with anything short of an ax. In these varieties the rind is prominent and the vascular bundles numerous, characters which are definitely Tripsacoid.

Interrelationships of characters

Since practically all of the characteristics considered here have shown a relationship with knob number, it is to be expected that they should also show interrelationships among themselves. These relationships exist and can undoubtedly be demonstrated statistically in many cases. It is not within the scope of this paper to examine this problem in detail but it should be pointed out how frequently certain characteristics are associated in the low-knob group. All but two of the varieties with six knobs or less are grown only at high altitudes, 6500 feet or more. All of them are susceptible to smut; all except one have pubescent leaf-sheaths; all except two are susceptible to lodging; all but five have non-fibrous root systems. In the high-knob group, however, this association breaks down, although it does not disappear completely. Among varieties with seven knobs or more, are thirteen which lack pubescence but show fifty per cent or more of lodging; while four pubescent varieties show no lodging and five additional ones show only ten to twelve per cent. A similar situation obtains with respect to the pubescence-smut and lodging-smut relationship.

All of this indicates that the low-knob group is a fairly homogeneous one only slightly affected by such Tripsacum admixture as it has received. This in turn suggests that there is a threshold below which the Tripsacum admixture has very little effect, at least upon some characters. After this threshold is crossed, the effect is not

completely proportional to the number of knobs and this may suggest that the *kind* as well as the *amount* of Tripsacum germplasm is a factor in the results.

In any event the high-knob group is not a homogeneous one, and it represents a complex mixture of characters derived from pure maize on the one hand and from Tripsacum on the other. The task of recognizing and classifying its races will be a formidable one even with the useful diagnostic characters which Anderson and Cutler (2) have brought to bear upon the problem of racial differences in maize.

The relative homogeneity of the low-knob group as contrasted with the marked heterogeneity of the high-knob group is not in keeping with Longley's suggestions, discussed in greater detail later, that a high-knob number signifies primitiveness. For, regardless of whether the characters which we have considered are primitive or otherwise, it would seem to be a difficult evolutionary step to bring together in the low-knob or "advanced" group all of the characteristics which are scattered at random through the varieties of the high-knob or "primitive" group. Evolution seldom, if ever, operates in this direction.

Interpretation and conclusions

How are we to interpret the various facts revealed by these studies of Guatemalan maize? 1. the great diversity in external morphological characters as well as in internal chromosome morphology; 2. the concentrated diversity occurring in one small area in Huehuetenango where teosinte is found in the wild and Tripsacum grows in profusion; 3. the relationship between knob numbers and other characteristics; 4. the restriction of low-knob varieties to high altitudes; and 5. the fact that practically all low-knob varieties are identical in certain char-

acteristics including pubescence, coarse seminal root systems and susceptibility to lodging and smut. A separate interpretation for each of these phenomena has already been suggested and we are now ready to draw the imaginary picture into which these more or less unrelated facts can be integrated.

At some time after maize had been domesticated in South America, a variety or a small group of varieties of cultivated maize was introduced into Central America. The ears of this maize were short and tapering, the cob was soft, the kernels fairly large but variable in size and very irregularly arranged upon the rachis. The plants exhibited pubescent leaf-sheaths and were decidedly susceptible to smut and lodging and this maize was satisfactory for culture only at high altitudes. We do not know whether the culture of this maize was ever widespread; at the present time it seems to be confined in Guatemala to the Departments of Quezaltenango, Totonicapan, El Quiche, Huehuetenango and probably San Marcos, and in Mexico to the State of Chiapas. We cannot determine whether it was grown at lower altitudes in this region but if it was it has now been completely replaced.

Some years or perhaps centuries after its introduction, in a small area in Huehuetenango, this South American maize hybridized with a species of Tripsacum by which some of the maize fields were surrounded. The first generation hybrid backcrossing once or repeatedly to its maize parent gave rise to a new plant, teosinte, in which the chromosome morphology closely resembled that of maize, except for certain pycnotic enlargements on the chromosomes imparted by the Tripsacum parent together with several simply inherited morphological characters[5]

[5] Langham (11) has shown that in crosses of Durango teosinte and maize, two of the important characters which distinguish maize from both teosinte and Tripsacum (paired spikelets and polystichous pis-

of Tripsacum which enabled the new plant to survive in the wild.

As a result of this hybridization there also arose new varieties of maize with varying numbers of Tripsacum knobs. The knobs themselves, comprising only heterochromatin, had no genic effects, but associated with the knobs were usually small segments of Tripsacum chromatin homologous or partially homologous to those in maize. This admixture with Tripsacum chromatin produced profound modifications in the maize. New varieties came into existence in which the seeds were smaller, more inclined to be indented, more uniform in size and shape and arranged in straight rows on the rachis. The cobs became firmer and less susceptible to shattering, the stalks became tough and resistant to lodging, the leaf-sheaths became glabrous instead of pubescent and the plants became resistant to smut. These new Tripsacoid varieties were much superior to the pure maize at lower altitudes, and rapidly replaced it, if indeed it was ever extensively grown there. At high altitudes, however, at 6500 feet and more, the original maize succeeded in holding its own and became but slightly contaminated with Tripsacum. In the meantime derivatives of the Tripsacum contaminated maize spread to all parts of Central, North and South America where maize is grown, except to the Andean region of Peru, Bolivia and Ecuador where pure maize (some of it quite similar in characteristics to the type introduced into Central America) continued, as it has in Central America, to resist the encroachment of the new varieties.

This imaginary picture accounts for all of the essential

tillate inflorescences) are inherited as simple Mendelian characters. Unpublished studies by the senior author show the inheritance to be less simple than this when Florida teosinte rather than Durango is one of the parents, but even here the situation is probably not unduly complex.

facts, and so far as we can determine, is in keeping with the facts of genetics, cytology, morphology and anthropology. Two minor details are lacking; the picture does not show how widespread the culture of pure maize had become before the hybridization with Tripsacum and it does not fix the date at which this hybridization occurred. These are questions which may be answered when studies of maize from other Central American countries and Mexico have been completed, and when botanical and archaeological data have been more completely correlated.

Alternative interpretations

So far we have discussed relationship between knob number and other characteristics only in terms of Tripsacum admixture as postulated by Mangelsdorf and Reeves. There are two other hypotheses on the origin of maize which may be considered, that of Montgomery (19) and Weatherwax (22) which has maize, teosinte and Tripsacum deriving independently from a remote common ancestor and that of Ascherson (3) which has maize deriving directly from teosinte. The limitations of both of these hypotheses in accounting for all of the facts have been discussed elsewhere (18). It should be pointed out, however, that the particular data presented in this paper can, without too much difficulty, be interpreted in terms of either of these alternative hypotheses, if other evidence bearing on the question is ignored.

Longley (15,16) has recently elaborated upon Ascherson's theory in interpreting the chromosome knob situation in the three American Maydeae and in drawing a picture of their possible relationship. A brief abstract of his conclusions follows:

The chromosomes of each species possess a definite and characteristic number of knob forming points. In Tripsacum and Guatemalan teosinte these points are more

numerous and are terminal; in maize and Mexican teosintes they are largely internal. The differences which now exist are assumed to be the result, not of structural changes, but of a few mutations which have affected chromosome gradients in such a way that knob positions in maize and Mexican teosintes are, on the average, closer to the centromere than in Guatemalan teosintes. Knob forming points, even though not visible, are regarded as always present. Knobs are formed only when adequate amounts of pycnotic material are available. Abundance of pycnotic material is associated with primitiveness. Tripsacum is regarded as the most primitive of the American Maydeae, standing near the base of the tree, teosinte from eastern Guatemala is regarded as the trunk of the tree; teosinte from western Guatemala as a major branch; maize and Mexican teosintes as the finer branches. It is suggested that maize originated directly from one of many teosinte strains. However, the suggestion, (Harshberger, 8; Collins, 5) that it has been derived from a hybrid of teosinte and an unknown grass, is not ruled out.

If we consider only the conclusion that an abundance of pycnotic material is associated with primitiveness, the relationship between knob numbers and other characteristics agrees almost as well with Longley's hypothesis as with that of Mangelsdorf and Reeves. In either case relationships between knob numbers and other characteristics are to be expected. The chief difference is that in one case the association is with "primitive" characteristics, in the other with "Tripsacoid" characteristics. The terms are partially synonymous but not completely so. Longley's hypothesis falls short in so many additional respects, however, that an interpretation of our data in terms of his hypothesis is virtually precluded.

Longley's conclusions are based almost wholly upon

chromosome morphology. This is certainly one of the most important types of evidence in a problem of this nature. However, it is not the only evidence available and it may be hazardous to overlook other types of data which can be brought to bear upon the problem. Furthermore the evidence from chromosome morphology does not support adequately the conclusions which have been drawn.

The presence of latent knob-forming points, invisible to the observer because adequate knob material is lacking, is questionable. If, when abundant knob material is supplied through hybridization, the knob-forming points still remain invisible, then another assumption—that the points have become temporarily inactive through disuse—is required (Longley, 16).

There is some question, too, whether the gradients affecting knob position actually exist. There is no necessity for assuming a gradient in teosintes with terminal knobs; if there is a gradient for terminal knobs there may well be a similar one for chromosome ends and telomeres. The internal knobs of maize certainly follow a rough pattern, at least they are not distributed at random over the chromosomes. No knobs are found in the immediate vicinity of centromeres. Perhaps there is some significance in the fact that they are most frequent in the general region where, if Darlington's (6) figures of chiasmata in maize are a criterion, crossing-over should be at a maximum. In any case the actual distribution of the knobs shows a poor agreement with the theoretical gradient (Longley, 14). A better fitting gradient could, no doubt, be calculated but perhaps the knob positions do not conform to any gradient in the sense in which the term has been used.

Still greater difficulties are encountered, however, when one attempts to carry to a logical conclusion, in terms of

known genetic and cytological mechanisms, the assumption that the knob positions in maize have been derived from those in teosinte, not by structural changes in the chromosomes, but as the result of a few mutations affecting the gradient. There is no doubt that chromosome behavior is partially gene-controlled. There are at least five genes in maize: asynaptic, sticky, polymitotic, and variable-sterile (two genes) affecting chromosome behavior and cell division (cf. Rhoades & McClintock, 20). In Allium there is a situation with respect to chiasmata which is almost identical with that of maize and teosinte with respect to knobs. In *A. fistulosum* the chiasmata are interstitially localized; in *A. cepa* the chiasmata are all terminal. The difference is due to a single recessive gene (Emsweller, 7; Levan, 12). But in this case as well as in similar cases all chromosomes in a single nucleus follow the same pattern; all are controlled by the same nuclear mechanism. In the F_1 hybrid of *A. fistulosum* × *A. cepa* all chiasmata are terminal. If the knob gradients in maize and teosinte are analagous, one must expect a decided shift in knob positions in F_1 hybrids of maize and teosinte. The internal maize knobs should move to the chromosome ends, most of the teosinte knobs should move to internal positions or both should move to intervening regions depending upon whether the mutant maize-gradient-controlling genes are recessive, dominant or intermediate in their effects. Such wholesale shifts have not been reported. In fact one has but to examine Longley's (13) illustration of the chromosomes in the F_1 hybrid of maize and Florida teosinte to be convinced that they do not occur.

Additional assumptions can be made, assumptions involving large numbers of mutant genes and the differential control of maize-gradient and teosinte-gradient chromosomes within the same nucleus. Longley (15)

apparently makes assumptions of this type when he interprets the knob situation in teosinte from western Guatemala. Here the four shortest chromosomes are supposedly controlled by the maize gradient, the six largest ones by the teosinte gradient, and the condition is regarded as one step in the evolution of teosinte to maize.

But all assumptions of this kind lead finally to the same impasse: recombinations resulting from segregation and crossing-over and involving the knobs of one species and the gradient-controlling genes of the other are inevitable. Hybridization of the two species is certain to be followed by general shifts in knob positions. Until such a phenomenon has been shown to occur, the basic tenet of Longley's hypothesis, that maize has stemmed directly from teosinte, will continue to remain inadequate in accounting for the established facts; as it has for more than fifty years since it was first proposed by Ascherson.

Anthropological implications

There is no doubt that western Guatemala is a concentrated center of diversity of maize. In so far as diversity is associated with centers of origin and, in the absence of conflicting evidence, this region must also be regarded as *a* center if not *the* center of origin for cultivated maize varieties.

If the older hypotheses which have maize deriving directly from teosinte are accepted, the implications are clear. In that case the region comprising the Department of Huehuetenango and perhaps the adjoining Departments of El Quiche, Totonicapan, Quezaltenango and San Marcos (as well as the adjoining State of Chiapas in Mexico) is the *primary* and probably the *only* center of domestication of maize. Presumably it is also the center where maize agriculture originated and from which it spread to all those parts of the New World where it was

practised in pre-Columbian times. In spite of numerous facts which are not in harmony with such a conclusion, the only evidence shown by Guatemalan maize varieties which is seriously in conflict, is the complete absence of varieties exhibiting any of those successive morphological changes which must have occurred in the evolution of a wild teosinte to a cultivated maize. Only the initial raw material and the end-product are now in evidence. All of the intermediate steps which must have occurred have been completely and miraculously erased, and this has happened in a region where very distinct varieties of maize have maintained themselves in a relative state of purity in localities not more than a few miles apart.

If, however, the newer hypothesis,—that teosinte is the hybrid progeny of maize rather than its progenitor,—is accepted, then this region is a secondary rather than the primary center of origin of cultivated maize varieties. It is not the area where maize culture originated or the focus from which it spread to all parts of the Americas. It is, however, the center from which the majority of maize varieties now cultivated in Central America, North America, the lowlands of South America and the West Indies, have been derived. This hypothesis requires the assumption that maize was introduced into Central America from South America. The fact that varieties are found in Guatemala which resemble those of the Andean region, not only in external appearance but also in their internal chromosome structure, appears to satisfy this assumption. This does not mean, however, that the area in western Guatemala where the hybridization with Tripsacum occurred is also the area into which maize was first introduced from South America. There may have been a widespread culture of Andean types of maize in Central America and even in parts of North America before the hybridization with Tripsacum occurred.

In so far as the history of maize has any bearing upon the problems of the pre-Columbian American cultures, it is evident that the anthropologist is faced with two clear-cut alternatives. Either the region in western Guatemala is the center of origin of all maize, of maize agriculture and the prehistoric cultures based upon maize agriculture; or it is no more than a secondary center from which maize varieties, originally introduced from South America and subsequently modified by admixture with Tripsacum, have spread.

Many anthropologists may continue to prefer the first alternative but some have seen the possibilities in the second. Both Kidder (10) and Lowie (17), in discussing the complete lack of evidence on cultures antecedent to the already well-developed "Archaic" in Middle America, have pointed to the inadequacy (from the anthropological standpoint) of the commonly accepted view that maize is derived from teosinte. Kidder's statements in this connection are of particular interest, because his suggestions (made before the hypothesis of Mangelsdorf and Reeves was published) anticipate several of their conclusions, as is demonstrated by the excerpts which follow:

"In the above guesses as to the time and location of basic New World culture first consideration has been given to the Middle American highlands: because agriculture seems to be a prerequisite necessity for the development of such a culture; because maize was the New World staple; and because *teocentli* currently believed to have played a part in the origin of maize, is apparently only to be found in those regions. . . .

The supposed rôle of Middle American *teocentli* in the ancestry of maize may, however, have confused us. Other possibilities must be considered, *Teocentli* may not have fathered maize; it may yet be found in South America. Some other plant ancestor, as yet undiscovered, perhaps even extinct as result of maize culture in the lands favorable to its growth, may exist or have existed in South America. . . .

If maize should prove to derive from South America the whole setup would in some respects be more comprehensible."

Significance in maize breeding

As the plant breeder begins to reach a point of diminishing returns in improving the varieties at hand, he is compelled to turn to centers of diversity for new characters. The maize varieties of western Guatemala, especially the Tripsacoid types, those with high knob numbers, constitute an untapped resevoir of germplasm which includes genes governing the expression of a number of valuable characteristics including fibrous root systems, resistance to lodging, resistance to smut and perhaps to other diseases. Here in concentrated form is to be found much of the germplasm which occurs greatly diluted in the commercial varieties of the United States.

There are few, if any, varieties in western Guatemala which would, as such, be useful for commercial production in the United States. Perhaps a few would have a place as silage corn, but even this is doubtful; the stalks are too tough to be cut with ordinary machinery. But if the breeder is looking, not for varieties but for genes, he will certainly find in Guatemalan maize, many which may be useful.

Most of the Guatemalan varieties are characterized by extreme lateness in maturity. Whether this characteristic is readily separable from others, can be determined only by experiment. Unpublished observations by the senior author indicate that large differences in time of maturity of corn varieties may be governed by a relatively small number of genes. In crosses of the early maturing inbred strain P 39 with tall, late varieties of Texas, it was possible in the backcross to P 39 to recover the type of ear and productiveness of P 39 with much of the lateness and vigor of the Texas varieties. Also Brunson (unpublished) has found that the indeterminate growth habit of Cuzcoid (a type resembling in its vegetative habit the Cuzco variety of Peru) is a simple Mendelian recessive,

and Langham has found a similar situation in Durango teosinte. These facts suggest that the separation of useful from undesirable genes in Guatemalan corn may not be too difficult. In any case the possibility of utilizing in practical corn improvement this complex reservoir of potentially valuable germplasm is not one to be completely overlooked or indefinitely postponed since Latin America is facing the same danger which the Corn-Belt has already met,—the extinction of potentially useful varieties as the result of widespread planting of a few selected types.

Summary

1. Chromosome knob counts, in 162 varieties from thirty-eight localities in western Guatemala, showed a range in knob numbers from one to sixteen.

2. All of the eighteen knob positions known in maize and in addition three positions not previously reported were encountered.

3. The greatest diversity was found in a small area in the Department of Huehuetenango where low-knob and high-knob varieties occur in close proximity. This is also the area in which teosinte is found growing in the wild.

4. The maize of western Guatemala exhibits great diversity in external morphological characteristics, but plants with six knobs or less are uniform in having pubescent leaf-sheaths, a coarse seminal root system and in susceptibility to lodging and smut. These varieties are found only at altitudes of 6500 feet or more.

5. The number of chromosome knobs is associated with various characteristics which may have been derived from Tripsacum.

6. The combined evidence suggests that a South American variety of maize—characterized by pubescent

leaf-sheaths, coarse seminal roots and susceptibility to lodging and smut—hybridized with a species of Tripsacum to produce the new genus Euchlaena and new varieties of maize exhibiting Tripsacum admixture.

7. Western Guatemala is thus regarded as a secondary center of origin of cultivated maize varieties.

8. The potential value for purposes of plant breeding of the Tripsacoid varieties of maize of Guatemala is pointed out.

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MAP OF GUATEMALA showing localities from which the maize varieties discussed in this paper were collected (and the average knob number for each locality).

EXPLANATION OF THE ILLUSTRATIONS

PLATE XXV. Representative ears of "Andean" (non-Tripsacoid) varieties of maize from Guatemala. Varieties of this type are found almost exclusively at high altitudes, 6500 feet and above, and are usually characterized by low chromosome-knob numbers (one to five in those illustrated), soft cobs, irregular rows of grain, pubescent leaf-sheaths, coarse seminal root systems and marked susceptibility to lodging and smut.

PLATE XXVI. Representative ears of the most strongly Tripsacoid varieties of maize from Guatemala. Varieties of this type usually have high chromosome-knob numbers (twelve to sixteen in those illustrated), firm cobs, regular rows of grain, glabrous leaf-sheaths, fibrous seminal roots and varying degrees of resistance to lodging and smut.

Plate XXV

Plate XXVI

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BOTANICAL MUSEUM LEAFLETS
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CAMBRIDGE, MASSACHUSETTS, OCTOBER 9, 1942 VOL. 10, NO. 9

AFRICAN ORCHIDS. XII

BY

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OWING TO the war situation it has not been found possible to publish this paper in the Kew Bulletin, in which the earlier numbers of this series have appeared.* Professor Oakes Ames, however, has kindly allowed me to continue the series in the Botanical Museum Leaflets. The present paper deals with the genera *Habenaria* and *Polystachya*, both of which I have been studying monographically for some years. It includes several new species from the very fine collection made by my colleague, Mr. E. Milne-Redhead, in Northern Rhodesia and Angola. The type specimens of all the new species are in the Kew Herbarium.

Habenaria (§. **Chlorinae**) **Eggelingii** *Summerhayes sp. nov.;* species *H. tenuispicae* Rendle valde affinis, sed spica crassiore, floribus fere duplo majoribus, sepalis lateralibus et petalis angustioribus, calcari antice (in parte apicali) magis dilatato distinguitur.

Herba perennis, erecta; tubera anguste ovoidea, 1–2 cm. longa, ut radices laxe tomentosa. *Caulis* erectus, ± robustus, spica inclusa usque ad 2 m. altus et 1 cm. diametro, fere glaber, e basi usque ad basin spicae ± foliatus.

* Continued from Bull. Misc. Inform. Kew (1939).

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Folia 7–12, 1–2 infima ad vaginas redacta, intermedia lanceolata vel lineari-lanceolata, acuta, usque ad 35 cm. longa et 2.5 cm. lata, superiora sensim decrescentia in bracteas abeuntia. *Spica* anguste cylindrica, usque ad 56 cm. longa, 1.5–2.5 cm. diametro, densiuscule multiflora; bracteae lanceolatae, acuminatae, inferiores flores superantes, superiores flores aequantes vel breviores. *Flores* suberecti, virides, sessiles vel subsessiles; ovarium 7–10 mm. longum. *Sepalum* intermedium elliptico-lanceolatum vel ovatum, acutum vel obtusum, valde concavum, 3.6–5.3 mm. longum, 1.9–3.4 mm. latum, uni-vel trinervium; sepala lateralia lanceolato-oblonga, subacuta, deflexa, 3.5–5.4 mm. longa, 1.3–2 mm. lata, uninervia; omnia sepala dorso juxta apicem breviter apiculata. *Petala* oblique triangulari-ovata, basi antice paulo dilatata, secus medium leviter carinata, 3.4–4.8 mm. longa, 1.8–3.3 mm. lata, saepius trinervia, cum sepalo intermedio agglutinata galeam ovatam vel suborbicularem formantia. *Labellum* subcarnosum, ambitu anguste flabellato-ligulatum, dimidio superiore (vel apicali) trilobatum, totum 4.2–6 mm. longum; lobus intermedius ligulatus, obtusus vel subacutus, 1.8–3 mm. longus, 0.6–1.4 mm. latus; lobi laterales leviter divergentes, lineari-ligulati, 0.7–2.3 mm. longi, 0.4–0.7 mm. lati; calcar dependens, basi cylindricum, dimidio apicali clavato-inflatum, 5–6.5 mm. longum, sub apice 0.7–1.2 mm. diametro. *Anthera* subreclinata, 1.2–1.3 mm. alta, loculis parallelis, canalibus nullis vel brevissimis; viscidia satis magna, orbicularia; staminodia distincta, transverse elliptica, leviter retusa, carnosa. *Brachia* stigmatifera subdeflexa, sursum ± clavato-incrassata, apice applanata vel leviter concava, ±tuberculata, 1–1.5 mm. longa; rostelli lobus intermedius brevissimus, globoso-dentiformis, lobi laterales ligulati, obtusi, 0.7 mm. longi, inferne brachiis stigmatiferis adnati.

UGANDA: Ruwenzori, Bajuku Valley, 3240 m., in Heather forest below 1st. valley step, Aug. 1933, *Eggeling 1286* (TYPE); Kigezi, Mt. Mgahinga, 3300 m., occasional in grassland, Aug. 1938, *Thomas 2469*; Mt. Elgon, 3000 m., local in Bamboo zone, Jan. 1918, *Dummer 3507*; same locality, 2700-3150 m., 1929, *Hancock & Soundy 104a*; Mt. Elgon, Bulambuli, 2700 m., in mud by stream, local, Sept. 1932, *Thomas 572*; same locality, 2850 m., among short grass beside small stream, May 1935, *Synge 1870*.

KENYA COLONY: Mt. Elgon, south side, 3240 m., on river bank in wooded and grassy country, Jan. 1937, *Tweedie 360*; same locality 3360 m., in grass along stream, Feb. 1935, *Taylor 3623*; Aberdare Mts., Naivasha-Nyeri track, 3240 m., in *Hagenia-Hypericum* forest, Oct. 1934, *Taylor 1390*; Mt. Kenya, north-west slopes, 3150 m., beside small stream in shade, mostly in fruit, April 1935, *Synge 1759*.

This species, which is evidently common at high altitudes on many of the mountains of East Africa, is a close relative of *H. tenuispica* Rendle with which it agrees in habit and in the general structure of the flower. Apart from the differences mentioned above in the diagnosis *H. Eggelingii* has, on the average, a greater proportion of the lip undivided than is the case in its ally.

Habenaria filicornis (*Thonn.*) *Lindley* Gen. & Sp. Orchid. (1835) 318.

Habenaria Spiranthes Reichenbach filius in Flora 48 (1865) 178.

Habenaria deflexa Hochstetter ex Kraenzlin in Engler Bot. Jahrb. 16 (1893) 146.

Habenaria Erythraeae Rolfe in Dyer Fl. Trop. Afr. 7 (1898) 215.

An examination of all these "species" reveals no essential differences between them and they must consequently be looked upon as conspecific. The species is distributed from Nigeria eastwards to Eritrea and southwards to Angola and Southern Rhodesia.

Habenaria chlorotica *Reichenbach filius* in Flora 48 (1865) 178.

Habenaria natalensis Reichenbach filius Otia Bot. Hamburg. (1881) 97.

The type specimens of these two species agree in all features. The distribution of the species is Northern Nigeria, Uganda, Kenya Colony, Angola, Northern Rhodesia, Transvaal and Natal. No doubt the gaps in this distribution, e.g. Tanganyika and Southern Rhodesia, will be filled as botanical exploration progresses.

H. chlorotica is very closely allied to *H. filicornis* and careful measurements and analysis of over forty gatherings have been necessary to convince me of their distinctness. The most obvious difference is in the leaves which are linear and about sixteen times as long as broad in the former, whereas in *H. filicornis* they are oblong or narrowly lanceolate and about five and one-half times as long as broad. In addition the plants are distinctly more robust in *H. chlorotica* with longer and more floriferous inflorescences. In the floral details differences are evident only on careful examination. In *H. chlorotica* the lobes of the lip are shorter, the stigmata are longer, and the middle lobe of the rostellum is longer with a very pronounced fleshy ridge at its base. This ridge is either absent or poorly developed in *H. filicornis*.

Habenaria peristyloides *A. Richard* in Ann. Sci. Nat. sér. 2, 14 (1840) 270, t. 17, fig. 3.

Habenaria combusta Ridley in Journ. Bot. 24 (1886) 294.

Habenaria cardiochila Kraenzlin in Engler Bot. Jahrb. 16 (1893) 144.

Habenaria Rendlei Rolfe in Dyer Fl. Trop. Afr. 7 (1898) 213.

Roeperocharis ukingensis Schlechter in Engler Bot. Jahrb. 53 (1915) 520.

Careful examination of the type specimens, figures and

descriptions of the above reveals no essential structural differences between them. There is considerable variation in habit, the type collection of *H. combusta* consisting of rather stunted specimens, while that of *H. Rendlei* includes very slender and narrow-leaved forms. All these, however, can be paralleled among material collected in Kenya Colony and Uganda and often two or more of the above "species" have been found mixed together. The petals vary a good deal in shape but often show great diversity on the same plant or indeed in the same flower! Throughout all the variations mentioned the general flower-structure remains unaltered, characteristic features being the trilobed lip with its large rounded basal auricles and recurved side-lobes, the club-shaped bordered stigmas adpressed to the lip-disk, and the large folded hooded rostellum standing in front of the contiguous anther-loculi. As I pointed out in a previous paper (Bull. Misc. Inform. Kew (1933) 251), *H. peristyloides* is quite different in column characters from the genus *Roeperocharis*, to which it bears a strong resemblance.

The distribution of the species is Abyssinia, Uganda, Kenya Colony, and southern Tanganyika Territory. It occurs in grass-lands between 5500 and 10,000 feet (1650-3000 metres) above sea level.

Habenaria (§. Commelinifoliae) coeloglossoides *Summerhayes sp. nov.* ; affinis *H. obovatae* Summerhayes, a qua floribus majoribus, petalis late ovatis margine antico unidentatis, labelli ungue ac lobis lateralibus quam intermedio longioribus, calcari dimidio superiore nec apice tantum inflato, antherae canalibus ac pollinii caudiculis brachia stigmatifera superantibus, rostelli lobo intermedio majore differt.

Herba terrestris, tubera et radices non visa. *Caulis* erectus, racemo incluso 15–40 cm. altus (ad 60 cm. fide

collect.), laxiuscule 6–9-foliatus. *Folia* 1-2 infima ± ad vaginas redacta, intermedia oblongo-vel lineari-lanceolata, acuta, apice breviter cuspidato-acuminata, usque ad 13 cm. longa et 1.7 cm. lata, superiora minora, bracteiformia. *Racemus* 5–11 cm. longus, fere 3 cm. diametro, laxiuscule 5–15-florus; bracteae lanceolatae, acuminatae, usque ad 2.5 cm. longae et 8 mm. latae, inferiores flores aequantes vel paulo superantes. *Flores* adscendentes, luteo-virides; pedicellus cum ovario 1–1.7 cm. longus. *Sepalum* intermedium erectum, elliptico-ovatum, apice obtusum, leviter retusum, 7 mm. longum, 4.5 mm. latum; sepala lateralia deflexa, curvatim semi-ovata, subacuta, circiter 7.5 mm. longa et 3.5 mm. lata; omnia sepala breviter ciliolata. *Petala* oblique late ovata, margine antico supra medium breviter uni-dentata, 7 mm. longa, 5.5–6 mm. lata, superne paulo incrassata et atrata. *Labellum* dimidio inferiore ligulatum, indivisum, superne trilobatum; pars indivisa 6 mm. longa, 2.5 mm. lata; lobus intermedius ligulatus, apice rotundatus, 4 mm. longus, 1 mm. latus; lobi laterales superne divergentes, lineares, 9–10 mm. longi, 1 mm. lati; calcar dependens, inferne cylindricum, dimidio apicali valde inflatum, acutum, 10 mm. longum, 1.7 mm. diametro. Anthera ± reclinata, connectivo lato haud alto, loculis valde separatis 1.5 mm. altis, canalibus porrectis gracilibus 2.5 mm. longis, staminodiis parvis ellipticis. *Brachia* stigmatifera apice applanato-clavato, juxta basin facie superiore appendice hemisphaerica papillosa instructa; rostelli lobus intermedius deltoideus, 1.5 mm. altus, lobi laterales lineares, oblique truncati, fere 2 mm. longi; ovarium curvatum, 9–10 mm. longum.

Uganda: Virunga Mts., Muhavura, on lower slopes, 2550 m., in short turf on rock, *Eggeling 982* (Type).

An interesting species showing affinities with several groups. The sepals and petals are very similar to those in

H. epipactidea Reichb.f., but the column and lip structure is very different. Both this and *H. obovata* Summerh., which is clearly its closest ally, have some of the characters of the genus *Roeperocharis*, notably the broad anther connective. In *H. coeloglossoides*, indeed, there is a papillose cushion near the base of each stigmatic arm, which may be looked upon as a reduced form of the upper stigmatic appendage in *Roeperocharis*. The rostellum, however, is quite different from that in the latter genus, while there are quite long anther canals and corresponding caudicles, features which are lacking in true *Roeperocharis* species.

The specific epithet is given on account of the strong superficial resemblance to *Coeloglossum viride* (L.) Hartm., the British Frog Orchid.

Habenaria gabonensis *Reichenbach filius* var. **psiloceras** (*Welw. ex Reichb.f.*) *Summerhayes comb. nov.*

Habenaria psiloceras Welwitsch ex Reichenbach filius in Flora 50 (1867) 99.

In a previous note dealing with *H. gabonensis* (Bull. Misc. Inform. Kew (1938) 144) I considered *H. psiloceras* as conspecific. Since then I have seen material collected in eastern Angola by Mr. E. Milne-Redhead which agrees very closely with Welwitsch's original specimens. Both gatherings have spurs from 13–16 cm. in length, whereas those in all the specimens of *H. gabonensis* which I have seen never exceed 9 cm. In view of the identity in the other details of the floral structure it seems most suitable to consider *H. psiloceras* as a long-spurred variety of *H. gabonensis* and I am therefore treating it as such. The variety is restricted to Angola so far as is known at present. *H. gabonensis* occurs in the southern Cameroons, Gabon, Princes Island, and possibly also in Angola from which I have seen a plant, collected by

A. W. Exell and F. A. Mendonça, which has well-developed fruits and withered flowers and is apparently referable to this species.

Habenaria sectio **Trachypetalae** *Summerhayes sect. nov.*

Caulis erectus, foliatus; folia lanceolata vel elliptico-lanceolata usque ovata, sursum in bracteas abeuntia; flores mediocres (1.5–3 cm. diametro); petala simplicia vel usque ad infra medium bifida, ± dense pilosa, cum sepalo intermedio agglutinata; labellum ex ungue satis longo trifidum, lobis linearibus intermedio quam lateralibus paulo longiore vel distincte breviore, calcari dependenti ovarium et pedicellum aequante, supra ± inflato; anthera brevis, crassa, connectivo lato, canalibus satis longis, staminodiis parvis; stigmata mediocria, crassiuscula, sursum tantum paulo incrassata; rostellum magnum, antheram aequans vel superans, apice saepius ± truncatum dentatum.

Species 3 adhuc notae, Africae tropicae indiginae.

Species typica sectionis:—*H. trachypetala* Kraenzlin.

I have created the above new section of *Habenaria* to contain several striking African species which cannot satisfactorily be placed in any of the sections recognised up to now. As the name indicates the striking feature in common is the possession of very hairy and often curiously shaped petals, which may be entire or divided to below the middle. Other correlated features are the vegetative characters; the structure of the lip, the anther, the stigmata and the rostellum middle-lobe. Until I have carried my researches on the genus *Habenaria* a good deal further, I am not prepared to make any comments on the relationship of the new section to any others at present recognised. The three species, one of which (*H. pubipetala* Summerhayes) is described below for the first time, may be distinguished as follows:

Petals entire but with very broad semi-orbicular base; anther canals twice as long as stigmas *H. trachypetala* Kraenzlin

Petals lobed, at least in the upper part; anther canals equalling or slightly exceeding the stigmas

Petals divided to below the middle; middle lobe of lip slightly longer than the side lobes; spur not spirally twisted; rostellum middle-lobe much overtopping the column, truncate at the apex *H. longirostris* Summerhayes

Petals divided irregularly in the upper part; middle lobe of lip much shorter than the side lobes; spur spirally twisted; rostellum middle-lobe equalling the anther, pointed at the apex *H. pubipetala* Summerhayes

Of the three species *H. longirostris* occurs in Northern Nigeria and Uganda, *H. trachypetala* in southern Tanganyika Territory and Nyasaland, while *H. pubipetala* is so far known only from Nyasaland.

Habenaria trachypetala *Kraenzlin* in Engler Bot. Jahrb. 30 (1901) 281.

Habenaria rhombocorys Schlechter in Engler Bot. Jahrb. 53 (1915) 501.

Comparison of the above indicates that they are conspecific. The flowers in *Goetze 817* (type of *H. trachypetala*) are smaller than in Schlechter's type, but agree in this respect with specimens in the Kew Herbarium collected in Iringa Province, Tanganyika Territory and in Nyasaland. These latter match *H. rhombocorys* in structural details. It is therefore evident that there is considerable variation in flower size in this species. It should be pointed out that Schlechter's description and the plate in Fedde Repert. Spec. Nov. Beih. 68 (1932) t. 33, Nr. 131 both give a wrong idea of the anther canals. These are described and drawn as very short, when nevertheless an examination of the type gathering shows them to be long and narrow, at least twice as long as the stigmas.

Habenaria (§. **Trachypetalae**) **pubipetala** *Summerhayes sp. nov.*; affinis *H. trachypetalae* Kraenzlin, a qua habitu laxiore, racemo laxifloro, floribus duplo minoribus, petalis ligulatis sursum paulo dilatatis apice breviter bilobatis, calcari spiraliter torto, antherae canalibus duplo brevioribus, rostelli lobo intermedio angustiore differt.

Herba terrestris, 40–70 cm. alta; caulis basi radices flexuosas villosulas emittens, erectus, teres, laxe foliatus, usque ad 7 mm. diametro. *Folia* 7–9, 1–2 infima ad vaginas redacta, intermedia elliptico-lanceolata vel elliptico-oblanceolata, valde acuta, tota usque ad 22 cm. longa et 4 cm. lata, superiora sensim decrescentia in bracteas abeuntia. *Racemus* laxe multiflorus, 15–25 cm. longus, circiter 5 cm. diametro; bracteae lanceolatae, acuminatae, usque ad 3 cm. longae et 5 mm. latae, inferiores pedicellum et ovarium aequantes. *Flores* fere patentes, albi (fide collect.); pedicellus gracilis, 8–10 mm. longus; ovarium leviter arcuatum, circiter 1 cm. longum. *Sepalum* intermedium valde concavum, latissime ovatum, apice obtuse acuminatum, ± reflexum, 3.5–4.5 mm. longum, explanatum circiter 4.5 mm. latum; sepala lateralia deflexa, oblique semi-orbicularia, basi angustata, valde recurvata, apiculata, 10–11 mm. longa, 3.5–4 mm. lata, intus papillato-puberula. *Petala* erecta, curvatim ± ligulata, dimidio apicali ± irregulariter bilobata vel margine postica unidentata, 8 mm. longa, 3 mm. lata, dense papillato-pubescentia et ciliata, margine postica inferne cum sepalo intermedio conglutinata cucullum latum sed haud profundum formantia. *Labellum* dependens, ± deflexum, duobus trientibus apicalibus trifidum; unguis ligulatus, sursum sensim dilatatus, lateribus reflexis, 5–7.5 mm. longus, marginibus ciliolatis; lobus intermedius late linearis, obtusus, rectus, 10–12 mm. longus, 0.6–0.9 mm. latus; lobi laterales apice spiraliter recurvati, lineares, circiter 17 mm. longi, 0.5–0.6 mm. lati; calcar deflexum,

dimidio apicali inflatum obtusum, medio spiraliter tortum, 2 cm. longum, supra medium 1.6–1.8 mm. diametro. *Anthera* erecta, crassa, 2.8–3.7 mm. alta, apice apiculata recurvata, canalibus porrectis apice angustatis 2 mm. longis; staminodia ligulata, leviter retusa. *Brachia* stigmatifera porrecta, cylindrica, apice truncata et leviter incrassata, 3.5 mm. longa, pubescentia; rostelli lobus intermedius anguste triangularis, superne productus, subacutus vel breviter bidenticulatus, antheram aequans.

Nyasaland: Kondowe to Karonga, 600–1800 m., July 1896, *Whyte*; Zomba Plateau, Mulungusi Stream, 1350 m., by stream side, March 1937, *Lawrence 341* (Type).

The differences between this and *H. trachypetala* Kraenzlin are given in the diagnosis, while the key given above indicates how the species differs from *H. longirostris* Summerhayes.

Habenaria (§. **Pentaceras**) **supplicans** *Summerhayes sp. nov.*; a *H. silvatica* Schlechter floribus minoribus, petali partitione anteriore quam posteriore longiore, labelli partitionibus lateralibus quam intermedia longioribus, calcari fere duplo longiore, antherae canalibus stigmata aequantibus; a *H. tridenti* Lindley habitu altiore, foliis laxioribus latioribusque, inflorescentia longiore multiflora, floribus arcuato-recurvatis, petali partitione anteriore et labelli partitionibus lateralibus pro rata longioribus differt.

Herba terrestris, gracilis, 35–60 cm. alta; tubera ellipsoidea vel globoso-ovoidea, 1.5–2.5 cm. longa, 1.5–2 cm. diametro; radices flexuosae, sparse lanatae. *Caulis* erectus, teres, regulariter 10–13-foliatus. *Folia* 2–3 infima ad vaginas redacta, intermedia lanceolata, leviter acuminata vel acutissima, laminae basi ± amplexicauli, tota usque ad 7.5 cm. longa et 1.7 cm. lata, 2–3 suprema satis minora, bracteis similia. *Inflorescentia* anguste cylindrica,

erecta, laxiuscule multiflora, 10–20 cm. longa, 3–3.5 cm. diametro; bracteae lanceolatae, acutae, usque ad 1.6 cm. longae et 4 mm. latae, floribus satis breviores. *Flores* lutescenti-virides, arcuato-recurvati, breviter pedicellati; pedicellus cum ovario arcuato 1–1.5 cm. longus. *Sepalum* intermedium fere horizontale, suborbiculari-ovatum, rotundato-obtusum, 3.5–4.5 mm. longum, 3.5–4 mm. latum, convexum, trinervium, nervis dorsaliter leviter carinatis; sepala lateralia deflexa, late semi-ovata, obtusa, 5 mm. longa, 2.3 mm. lata, trinervia. *Petala* alte bipartita; partitio posterior lineari-ligulata, subacuta, 4 mm. longa, 0.8 mm. lata, cum sepalo intermedio agglutinata cucullum latum haud profundum formans; partitio anterior reflexo-deflexa, cornu basi applanato sursum subulato similis, 6 mm. longa, basi 0.5 mm. lata. *Labellum* e parte basali indivisa 1–1.5 mm. longa tripartitum; partitio intermedia recta, lineari-ligulata, obtusa, subcarnosa, 4.5 mm. longa, 0.6–0.8 mm. lata; partitiones laterales curvato-reflexae, basi lineares superne subulatae, 6–7.5 mm. longae, basi 0.5 mm. latae; calcar curvato-dependens, superne (duobus trientibus apicalibus) leviter inflatum, apice subacutum, 1.4 cm. longum, 1–1.3 mm. diametro. *Anthera* 2 mm. alta, apice rotundata, loculis parallelis, canalibus porrectis 0.7 mm. longis stigmata aequantibus, staminodiis carnosis transverse ellipsoideis. *Brachia* stigmatifera leviter recurvatim porrecta, leviter clavata, 2 mm. longa; rostelli lobus intermedius late triangularis, obtusus, 0.5 mm. altus.

Northern Rhodesia: Mwinilunga District, about 1 mile south of Matonchi Farm, in *Brachystegia*-woodland, Dec. 31st., 1937, *Milne-Redhead 3902* (Type). "Bracts, sepals and spur green; petals, stigmas and lip yellow-green; staminodes and rostellum whitish; anther yellow."

Angola: Moxico District, just south of Lusavo Falls, in *Brachystegia*-woodland on sand, Jan. 12th., 1938, *Milne-Redhead 4075*. "Sepals and ovary green; petals and lip yellow-green; stigmas pale green; rostellum and staminodes whitish-green; anther yellowish."

A typical member of sect. *Pentaceras*, differing from the other species in the way in which the various characters are combined. The specific epithet is given because of the resemblance of the flowers to a number of tiny men bowed in prayer. The description is drawn up from dried and spirit material of both gatherings.

Habenaria tenuifolia *Summerhayes nom. nov.*

Habenaria hymenophylla Schlechter in Engler Bot. Jahrb. 53 (1915) 498, non Schlechter (1911).

In view of the earlier use of the epithet *hymenophylla* for an Australian species, I propose the above new name for the African plant described by Schlechter. I have now seen material of this species from southern Tanganyika Territory, the Katanga district of the Belgian Congo, Northern Rhodesia and eastern Angola.

Habenaria njamnjamica *Kraenzlin* in Engler Bot. Jahrb. 16 (1893) 106.

Habenaria foliolosa Kraenzlin l.c. 51 (1914) 372.

On examination of the type gatherings of these two species I can find no significant differences. The species has been collected in the Sudan, Kenya Colony, Belgian Congo and Northern Rhodesia.

The members of the group of species within sect. *Pentaceras*, to which this species belongs, resemble strongly certain species in sect. *Ceratopetalae*, particularly *H. stenorhynchus* Schlechter. From these they may be distinguished by the thin, not horn-like, front lobe of the petals and the gradually clavate, not capitate, stigmas, as well as by other less obvious features.

Habenaria praestans *Rendle* in Journ. Bot. 33 (1895) 293.

Habenaria ctenophora Schlechter in Engler Bot. Jahrb. 53 (1915) 500.

Examination of the type gatherings of the above two species and of about twenty other gatherings reveals no essential structural differences. There is some variation in the petals which may be either obtuse or somewhat acute at the apex, may have a sort of bulge or corner on the anticous margin in the lower part, and may be either entirely glabrous or puberulous in the lower half. The West African *H. Mannii* Hook. f. is very closely allied to *H. praestans*, differing in the much darker (almost black) colour assumed on drying and the narrower, thicker, apparently deeply V-shaped leaves, which never flatten out when dried but fold so as to show one half only. As there are practically no floral differences perhaps the two species may be better treated as geographical forms or subspecies of one widely-ranging species. On the other hand, the very hairy lip-claw and main segments and the slenderly stalked capitate or clavate-capitate staminodes distinguish both species from the species described below (*H. keniensis* Summerh.).

Habenaria (§. **Multipartitae**) **keniensis** *Summerhayes sp. nov.* ; affinis *H. praestanti* Rendle, a qua planta siccitate pallidiore, foliis pro rata brevioribus et latioribus, floribus paulo minoribus, petalis magis pubescentibus et ciliatis, labelli segmentis primariis papillato-puberulis nec pubescentibus, antherae connectivo duplo angustiore, staminodiis sessilibus, brachiorum stigmatiferorum parte libera fere duplo longiore facile distinguenda.

Herba terrestris, 20–65 cm. alta; tubera ovoideo-ellipsoidea, 2.5 cm. longa, 1–1.5 cm. diametro. *Caulis* erectus, teres, glaber, usque ad inflorescentiam ± regulariter 6–7-foliatus, basi usque ad fere 1 cm. diametro. *Folia* 1–2 infima ad vaginas redacta, cetera lanceolata usque ovata vel elliptico-ovata, acuminata, basi breviter vaginantia, usque ad 15 cm. longa et 6 cm. lata, sursum

sensim decrescentia in bracteas abeuntia, glabra, marginibus interdum papillato-ciliolatis. *Racemus* rectus, 12–22 cm. longus, 5–8 cm. diametro, subdense 10–15-florus; bracteae foliaceae, lanceolatae, acuminatae, usque ad 7 cm. longae, inferiores flores superantes, glabrae, marginibus interdum ciliolatis. *Flores* adscendentes, partim virides, partim albi; pedicellus 2–4 mm. longus; ovarium 1.5–2 cm. longum. *Sepalum* intermedium erectum, late lanceolatum, acutum vel breviter acuminatum, convexum, 1.3–1.7 cm. longum, 7–9 mm. latum; sepala lateralia deflexa, oblique oblongo-lanceolata, breviter acuminata, 1.5–2.3 cm. longa, 6–7.5 mm. lata; omnia sepala apicem versus papillato-ciliolata. *Petala* libera vel cum sepalo intermedio leviter agglutinata, lunato-ligulata, acuta, 1.2–1.8 cm. longa, medio 3.8–5 mm. lata, breviter pubescentia, ciliata. *Labellum* ex ungue ligulato circiter 5 mm. longo et 1.5–2.5 mm. lato tripartitum, in toto 1.8–2.5 cm. longum, circiter 3 cm. latum; partitio intermedia recta, lineari-ligulata, obtusa vel subacuta, 1.2–1.8 cm. longa, basi 1.5–2.2 mm. lata, supra carina mediana angusta laevi 1–1.5 mm. alta instructa; partitiones laterales divergentes, lineari-ligulatae, subcarnosae, 1.5–2 cm. longae, basi 1.2–1.6 mm. latae, margine exteriore pectinato-fimbriatae, fimbriis (vel segmentis secundariis) 6–10 subulato-filiformibus usque ad 1.4 cm. longis; unguis et segmenta primaria inferne puberula; calcar dependens, leviter sigmoideum, anguste cylindricum, apice subacutum, dimidio apicali leviter inflatum, 1.8–2.8 cm. longum, 1.8–2.4 mm. diametro. *Antherae* connectivum taeniale, ± hippocrepiforme, 4–6 mm. latum, dorso 2.5–3 mm. altum; loculi reclinati, ovoideo-ellipsoidei, 3–4.5 mm. longi; canales porrecti, tenues, 4–5.5 mm. longi; staminodia sessilia, ellipsoidea, 0.5–0.7 mm. longa. *Brachia* stigmatifera basi rostello adnata, deinde descendentia, dimidio apicali curvatim adscendentia; pars libera

tota 15–16.5 mm. longa; pars receptiva 5–8.5 mm. longa, leviter incrassata, antice applanata; rostelli lobus intermedius rotundato-triangularis, brevissimus, carnosus.

KENYA COLONY: Mt. Elgon, Sosian River, 2100 m., in bush country, May 1937, *Tisdall in Tweedie 387*; Mt. Elgon, 2250 m., in grassland, May 1920, *Lindblom* (Herb. Stockholm); Mau, 2400 m., *Battiscombe 1220* (TYPE); Londiani, south of Eldama Ravine, 2370 m., July 1933, *Graham 3227*; Western foot of Aberdare Mts., near L. Olbolossat, 1950-2100 m., *Dowson 642*; Aberdare Mts., Kinangop, 2640-2670 m., in crevices between rocks close to marshy area above river, April 1938, *Chandler 2399*.

This species, which I had previously confused with *H. praestans* Rendle, differs by the characters given in the diagnosis. Perhaps the most important of these is the relatively narrow anther-connective, this being about half as wide as in *H. praestans*. The latter species has not yet been recorded in Kenya Colony where it is apparently replaced by *H. keniensis*.

Habenaria macrantha *Hochstetter ex A. Richard* Tent. Fl. Abyss. 2 (1851) 294, t. 87.

I have always found difficulty in obtaining a clear concept of this species by a cursory examination of the specimens cited by Rolfe in the Flora of Tropical Africa (vol. 7, p. 224). A careful examination, however, has led me to conclude that several different species are represented under these gatherings in the Kew Herbarium. Of these *Schimper 626* is very close to *H. keniensis* Summerh., described above, being perhaps an abnormal specimen with a much enlarged basal part of the spur. The characteristic feature of true *H. macrantha* (*Schimper 1256*) lies in the fusion of the base of the spur to the anther connective, on which fusion the lateral sepals and petals are borne, the mouth of the spur thus being hidden and not very obvious. This is well shown in Richard's plate. In addition the stigmatic surfaces are shorter and more

swollen than in *H. praestans* and *H. splendens* Rendle, while the staminodes are quite sessile. There are other differences in the petals and the lip, the middle lobe of which in *H. macrantha* has a marked longitudinal keel which is absent from both the species mentioned above. There are in the Kew Herbarium three more recently gathered specimens of *H. macrantha*, one from Mt. Elgon in Uganda, the other two from the Aberdare Mts. in Kenya Colony.

Habenaria (§. **Multipartitae**) **cavatibrachia** *Summerhayes sp. nov.*; affinis *H. trichuri* A. Richard, a qua floribus duplo majoribus, calcari plus quam quintuplo longiore, rostelli lobis lateralibus apice adscendentibus incrassatis cavatis differt.

Herba terrestris, fere omnino glabra, 30–60 cm. alta; tubera non visa. *Caulis* erectus, teres, basi usque ad 7 mm. diametro, 5–8-foliatus. *Folia* 1–2 infima ad vaginas redacta, cetera lanceolata vel elliptico-lanceolata, breviter acuminata, basi breviter vaginantia, 6–14 cm. longa, 1.7–3.5 cm. lata, sursum sensim decrescentia. *Racemus* rectus, 5–15 cm. longus, 5–10 cm. diametro, usque ad 10-florus; bracteae foliaceae, elliptico-vel oblongo-lanceolatae, acuminatae, usque ad 5 cm. longae, inferiores flores fere aequantes. *Flores* adscendentes vel erecto-patentes, virides; pedicellus circiter 1 cm. longus; ovarium 2–2.5 cm. longum. *Sepalum* intermedium erectum, ellipticum vel elliptico-ovatum, apice ± rotundatum et mucronatum, concavum, 1.3–2 cm. longum, 1.1–1.4 cm. latum; sepala lateralia patentia, oblique anguste vel semi-ovata, subacuta, 1.8–2.5 cm. longa, 8.5–10.5 mm. lata; omnia sepala distincte trinervia, venis transversis numerosis. *Petala* libera, erecta, curvatim oblongo-elliptica vel anguste oblongo-ovata, obtusa vel subacuta, basi margine antica rotundato-cordata, 1.2–1.7 cm. longa, 6.5–8 mm. lata,

margine antica inferne ciliata cetera glaberrima. *Labellum* ex ungue flabellato-ligulato 7–10 mm. longo tripartitum, totum 2–2.5 cm. longum, 1.5–2.5 cm. latum; partitio intermedia recta, lineari-ligulata, obtusa, 1.25–1.5 cm. longa, basi 2.5 3.5 mm. lata, longitudinaliter convexa; partitiones laterales leviter divergentes, lineari-ligulatae, carnosulae, 1.6–2.2 cm. longae, basi 1.7–2.5 mm. latae, margine exteriore pectinato-fimbriatae, fimbriis (vel segmentis secundariis) 3–8 subulato-filiformibus usque ad 1.25 cm. longis; unguis et segmentorum primariorum bases inferne papillato-puberuli; calcar dependens, filiformi-cylindraceum, dimidio apicali modice inflatum, subacutum, 11–14 cm. longum, superne 2–3 mm. diametro. *Anthera* erecta, 4.5–6.5 mm. alta, connectivo angustissimo, loculis reclinato-adscendentibus 5–6 mm. longis, canalibus brevibus fere 1 mm. longis, staminodiis semiorbicularis columnae omnino adnatis. *Brachia* stigmatifera crassa, porrecta, superne leviter recurvata, 5–6.5 cm. longa; pars receptiva obliqua, convexa, laevis, 2.5–4 mm. longa; rostelli lobus intermedius latissime rotundato-triangularis, lobi laterales apice erecti, valde incrassati, facie superiore leviter excavati.

Kenya Colony: Mt. Elgon, south slopes, 2400 m., in burnt forest, June 1936, *Mainwaring K2* (Type); West Lembus Forest, 2580-3700 m., in grassland, July 1936, *Graham 3505*; Kedowa, 2190 m., June 1933, *Graham 3225*.

Abyssinia: Arussi Plateau, Oct. 1908, *Drake-Brockman 203*.

Evidently a close ally of the Abyssinian *H. tricruris* A. Rich., the characteristic feature of both species being the very narrow anther connective, the two loculi being almost contiguous. From the other characters, however, the species seem to be placed naturally in sect. *Multipartitae*. The specific epithet of the new species is given in allusion to the hollowed-out apices of the rostellum arms, the viscidia of the pollinia lying in these cavities. The

species possesses much the longest spur of any of the African members of the section.

Habenaria (§. **Diphyllae**) **decurvirostris** *Summerhayes sp. nov.*; affinis *H. calvae* Rolfe, a qua folio singulo, inflorescentia latiore et laxiore, floribus paulo minoribus, petali partitione antica decurvata quam postica fere duplo longiore, calcari apice tantum inflato, rostelli lobis lateralibus leviter decurvatis facile distinguenda.

Herba terrestris, 20–30 cm. alta; tubera globosa vel ellipsoidea, 2 cm. longa, 1.5–2 cm. diametro, breviter tomentosa. *Folium* singulum, basale, solo adpressum, reniformi-orbiculare, apice cuspidato-acuminatum, basi cordatum, ±amplexicaule, 2.5–4.5 cm. longum, 2–4.5 cm. latum, carnosum, sordide viride. *Scapus* erectus, teres, cataphyllis numerosis lanceolato-linearibus acutis adscendentibus luteo-viridibus usque ad 2 cm. longis instructus; racemus 11–16 cm. longus, 3–4 cm. diametro, laxiuscule vel densiuscule multiflorus; bracteae cataphyllis similes, floribus breviores. *Flores* erecto-patentes, virides; pedicellus gracilis, 3–6 mm. longus; ovarium leviter arcuatum, 8–11 mm. longum. *Sepalum* intermedium erectum, ovatum, concavum, cucullato-obtusum, 3.2–3.5 mm. longum, circiter 2.5 mm. latum; sepala lateralia deflexa, oblique et late semi-obovata, acuta, 5.5 mm. longa, 3–3.4 mm. lata, trinervia, ±revoluta; omnia sepala viridia. *Petala* bipartita, luteo-viridia; partitio postica erecta, lanceolato-ligulata, acuta, 3.5 mm. longa, 0.7 mm. lata, sepalo intermedio adhaerens et cum eo cucullum latum formans; partitio antica incurvatim descendens, linearis, obtusa, crassiuscula, 5.5–6.5 mm. longa, 0.5–0.8 mm. lata, dimidio basali labello adnata. *Labellum* trientibus duobus distalibus trilobatum, luteo-viride, dependens, subcarnosum; lobus intermedius subspathulato-ligulatus, apice rotundatus vel obtusus, 4.5–5.5 mm.

longus, 1 1.3 mm. latus, marginibus inferne leviter recurvatis; lobi laterales leviter divergentes, ligulati vel oblanceolato-ligulati, apice rotundati vel fere truncati, 4.5 5 mm. longi, 0.8–1.2 mm. lati; calcar incurvatim dependens, inferne anguste cylindraceum, apice tantum inflatum, obtusum, 9 10 mm. longum. *Columna* 3 mm. alta, pallide viridis; anthera erecta, loculis parallelis 2 mm. longis, canalibus (et rostelli lobis lateralibus) leviter decurvatim patentibus 1.5 mm. longis, staminodiis lenticulari-ellipsoideis 0.8 1 mm. longis; brachia stigmatifera valde decurvata, labello adpressa, lingulata, complanata, 2–2.5 mm. longa; rostelli lobus intermedius obtuse triangularis.

NORTHERN RHODESIA: Mwinilunga District, Dobeka Plain, one-half mile southwest of Dobeka Bridge, on sandy ground in open near edge of *Cryptosepalum*-woodland, Dec. 14th., 1937, *Milne-Redhead 3664* (TYPE); plain north-east of Dobeka Bridge, on sandy ground in open, Dec. 30th., 1937, *Milne-Redhead 3664A*.

A rather striking little species characterised by the single basal leaf, the open inflorescence, the front petal-lobe directed downwards and adnate to the lip in the lower part, and by the shortly stalked anther in which the canals, instead of being porrect or curved upwards, are gently curved downwards.

Habenaria (§. **Diphyllae**) **unifoliata** *Summerhayes sp. nov.*; affinis *H. lithophilae* Schlechter, a qua folio singulo, floribus paulo minoribus, petali partitione antica et labelli partitionibus lateralibus pro rata longioribus, calcari paulo breviore, antherae canalibus longioribus differt.

Herba terrestris, 35 45 cm. alta; tubera globosa vel ellipsoidea, circiter 2 cm. longa, 1.5 2 cm. diametro, breviter tomentosa. *Folium* singulum, basale, solo adpressum, suborbiculare, latissime et obtusissime apiculatum, supra basin profunde cordatum, basi ipsa vaginans,

4–7 cm. longum, 5–7 cm. latum. *Scapus* erectus, teres, basi 2–3 mm. diametro, cataphyllis numerosis lanceolato-linearibus acutissimis fere erectis pallide viridibus usque ad 2.5 cm. longis instructus; racemus 15–18 cm. longus, 2.5–3 cm. diametro, laxiuscule 20–35-florus; bracteae anguste lanceolatae, acuminatae, floribus breviores. *Flores* erecto-patentes, virides; pedicellus gracilis, 3–4 mm. longus; ovarium leviter curvatum, 7–9 mm. longum. *Sepalum* intermedium erectum, concavum, ovato-ellipticum, acutum, 4.8–6.3 mm. longum, 3.5–4 mm. latum; sepala lateralia deflexa, oblique ovata vel oblongo-ovata, late apiculato-acuta, 5.7–7 mm. longa, 3–3.4 mm. lata; omnia sepala trinervia nervis dorso humiliter carinatis, marginibus superne leviter scaberulis, pallide viridia, papillosa. *Petala* fere ad basin bipartita, luteo-viridia; partitio postica erecta, leviter curvatim cultrato-ligulata, subacuta, sepalum intermedium excedens, 5.6–7.8 mm. longa, basi fere 1 mm. lata, apicem versus scaberula et leviter undulata; partitio antica basi labello et sepalo laterali adnata, deinde ± erecta, circinatim incurvata, lineari-subulata, 9–11 mm. longa, basi 0.3–0.4 mm. lata, superne papillosa. *Labellum* profunde tripartitum; pars basalis indivisa 2 mm. longa; partitio intermedia fere recta, apice leviter recurvata, lineari-ligulata, subacuta, 6.5–9 mm. longa, basi 1–1.2 mm. lata, lateribus reflexis; partitiones laterales ab intermedia leviter divergentes, petali partitionibus anticis similes, dependentes, circinatim recurvatae, lineari-subulatae, 10–14 mm. longae, basi 0.4 mm. latae; labellum omnino papillosum; calcar dependens, cylindricum, leviter spiraliter tortum, dimidio apicali inflatum, obtusum, 12–13.5 mm. longum, 1–1.2 mm. diametro. *Anthera* erecta, circiter 3 mm. alta, loculis parallelis 2.3 mm. longis, canalibus porrectis 1.5 mm. longis, staminodiis obovato-clavatis fere 1.5 mm. longis. *Brachia* stigmatifera deorsum porrecta, apice paulo recurvata, labelli basi ± ad-

pressa, teretia vel subteretia, 2.5–3 mm. longa; rostelli lobus intermedius late rotundato-deltoideus.

Northern Rhodesia: Mwinilunga District, just north of dambo to north-east of Dobeka Bridge, in *Cryptosepalum*-woodland on sand, Dec. 30th., 1937, *Milne-Redhead 3886* (Type).

Angola: Moxico District, just south of Lusavo Falls, in *Brachystegia-Isoberlinia*-woodland on sand, Jan. 12th., 1938, *Milne-Redhead 4072*.

This, like *H. decurvirostris* Summerh., possesses only a single leaf at the base of the scape, but in floral structure more closely resembles *H. lithophila* Schlechter than *H. calva* Rolfe. From *H. decurvirostris* it can be easily recognised by the narrower inflorescence, the very long and subulate anterior petal- and lateral lip-segments and the much stouter and almost straight spur. The structure of the column also differs in a number of points, particularly the anther canals and rostellum side-lobes which in *H. decurvirostris* turn downwards but in *H. unifoliata* are slightly curved upwards.

Habenaria (§. **Diphyllae**) **Edgari** *Summerhayes sp. nov.*; affinis *H. Mechowii* Reichenbach filius, sed foliis minoribus, inflorescentiis 2–4-floris nec ultra 5-floris, pedicellis plus duplo longioribus, floribus paulo majoribus, petali partitione antica et labelli partitionibus lateralibus longioribus, calcari 15–25 cm. longo, brachiis stigmatiferis brevioribus crassioribus facile distinguenda.

Herba terrestris, 30–65 cm. alta, fere omnino glabra; tubera ovoidea vel ellipsoideo-fusiformia, 2.5–5 cm. longa, 1.5–2 cm. diametro, subdense tomentosa. *Folia* 2, basalia, solo adpressa, transverse elliptica vel suborbicularia, apice truncata et emarginata, apice ipso late breviterque apiculata, basi breviter vaginantia, 3–3.5 cm. longa, 3–5.5 cm. lata. *Scapus* erectus, robustus, teres, basi usque ad 8 mm. diametro, cataphyllis 8–11 foliaceis ovatis acuminatis usque ad 4.5 cm. longis et 2.5 cm. latis instructus; racemus 2–4-florus, floribus inclusis 15–25 cm. longus;

bracteae cataphyllis similes, pedicellis breviores. *Flores* fere erecti, partim pallide olivacei partim cremeo-albi; pedicellus gracilis, 3.5–6 cm. longus; ovarium leviter curvatum, 2–3 cm. longum. *Sepalum* intermedium erectum, concavum, late elliptico-lanceolatum, acuminatum, 2–2.8 cm. longum, 8–13 mm. latum; sepala lateralia deflexo-patentia, oblique semi-ovata, abrupte et curvatim acuminata, 2.5–3.2 cm. longa, 7–10.5 mm. lata; omnia sepala trinervia, nervis dorso carinatis carinis scaberulis, olivaceo-viridia. *Petala* fere ad basin bipartita, pallide cremeo- vel virescenti-alba; partitio postica erecto-patens vel fere patens, linearis, acuta, 2.5–3 cm. longa, fere 2 mm. lata, marginibus revolutis; partitio antica patens, inferne linearis, superne subulata, 5–6.5 cm. longa, basi 2 mm. lata. *Labellum* fere ad basin tripartitum; partitio intermedia dependens, e basi latiore triangulari lineari-ligulata, acuta, 3 cm. longa, medio 2 mm. lata, pallide olivaceo-viridis; partitiones laterales valde divergentes, inferne lineares, superne subulatae, 4–5 cm. longae, basi circiter 2 mm. latae, cremeo- vel virescenti-albae; calcar dependens, viride, anguste cylindricum, triente apicali modice inflatum, 15–25 cm. longum, parte apicali circiter 3 mm. diametro. *Anthera* erecta, 1.3–1.4 cm. alta, obtuse apiculata, loculis parallelis leviter arcuatis 8 mm. longis sulphureis, canalibus leviter incurvatim porrectis 6–10 mm. longis, staminodiis serpentis linguae similibus erectis 3 mm. longis, luteis. *Brachia* stigmatifera crasse cylindrica, apice cochleato-capitata, 11 mm. longa; rostelli lobus intermedius magnus, antheram antipositus et eam fere aequans, late triangularis, apice angustatus subito recurvatus, dense papillosus, fere 1 cm. longus, in lobos laterales sensim transiens.

Northern Rhodesia: Mwinilunga District, on slope east of R. Kaoomba, in grassland with *Lannea*, *Sphenostylis*, etc., Dec. 22nd., 1937, *Milne-Redhead 3781* (Type).

Belgian Congo: Katanga District, Kafuba, fairly common, Dec. 22nd., 1923, *von Hirschberg 156*.

This truly remarkable plant is evidently a near ally of *H. Mechrowii* Reichb. f., from which it differs by the characters given in the diagnosis. The most striking differences are the long pedicels which carry the flowers well away from the bracts and make the inflorescence much more open, and the very much longer spur. In general floral structure there is a strong resemblance to many members of sect. *Ceratopetalae*, e.g. *H. cirrhata* (Lindl.) Reichb.f. and *H. Laurentii* De Wildem., but the column is different while the stigmas are shorter and thicker.

The name is given in honour of the collector, Mr. Edgar Milne-Redhead, whose collection of Northern Rhodesian orchids, including nearly 250 gatherings, consisting of numerous perfectly dried specimens accompanied by flowers in liquid preservative and ample colour and habitat notes, must rank as one of the finest ever made on the African continent.

Polystachya tessellata *Lindley* in Journ. Linn. Soc. Lond. Bot. 6 (1862) 130.

Polystachya trieuris Reichenbach filius in Flora 50 (1867) 118.

Polystachya hypocrita Reichenbach filius in Gard. Chron. new series 16 (1881) 685.

Polystachya Buchanani Rolfe in Bull. Misc. Inform. Kew 1893 (1894) 335.

Polystachya similis Bolus Ic. Orch. Austr.-Afric. 2 (1911) t. 33, partim—Rolfe in Dyer Fl. Cap. 5, sect. 3 (1912) 63, partim, non Reichenbach filius.

Polystachya Lettowiana Kraenzlin in Fedde Repert. Spec. Nov. Beih. 39 (1926) 54.

Polystachya lepidantha Kraenzlin in Bull. Misc. Inform. Kew (1926) 290.

On two previous occasions (in Hutch. & Dalz. Fl. West Trop. Afr. 2 (1936) 432 and in Bull. Misc. Inform. Kew 1939, pp. 495, 496) I have found it necessary to reduce supposedly distinct species to *P. tessellata*. Careful examination of all the African species belonging to sect. *Eupolystachya* indicates that the various species cited above are conspecific. The original specimen of Reichenbach's *P. similis* is quite distinct, the lip being devoid of the keel characteristic of *P. tessellata*, but the specimen figured by Bolus and several of those cited by him and by Rolfe do not agree with the type and are obviously *P. tessellata*.

Kraenzlin states that in *P. lepidantha* the interior of the flower is covered with scales of a type found nowhere else in the genus. In spite of very careful examination of the type specimen with a powerful binocular microscope, I have been unable to discover any sort of scales. I can only conclude that Kraenzlin's impression of silvery scales was produced by reflections from the "bullations" or "tessellations" which are so characteristic of the sepals of this species. Actually the inner surfaces are perfectly smooth with no outgrowths of any kind.

As a result of my researches *P. tessellata* is now known to occur in Upper Guinea (French Guinea to Cameroons Mountain), the islands in the Gulf of Guinea (Fernando Po, St. Thomas, Annobon), French Equatorial Africa (French Cameroons, Gabon, Oubangui-Chari), Uganda, Belgian Congo, southern Tanganyika Territory, Angola, Northern Rhodesia, Mozambique, Natal and eastern Cape Province.

The differences between *P. tessellata* on the one hand and *P. rufinula* Reichb.f. and *P. zanguebarica* Rolfe on the other are very small and are doubtfully of specific value. Unfortunately the country of origin of both these latter species is very doubtful, since, although said to come

from Zanzibar, the only certainty is that the original specimens were received from Sir John Kirk who was for many years British Consul at Zanzibar. As Kirk, however, is known to have travelled extensively we cannot be sure that the specimens came from Zanzibar or from any other place on the African mainland. In the Reichenbach herbarium there is a specimen, referred to *P. rufinula*, which was collected by Kirk in the Comoro Islands. It is curious that with the exception of a small portion of an inflorescence received from J. T. Last, no specimens belonging to the same group as either of the two species have since been collected anywhere near Zanzibar, the nearest localities being in the Livingstone Mountains near Lake Nyasa where *P. tessellata* occurs.

Polystachya modesta *Reichenbach filius* in Flora 50 (1867) 114.

Polystachya rigidula Reichenbach filius l.c. 117.
Polystachya shirensis Reichenbach filius Otia Bot. Hamburg. (1881) 112.
Polystachya similis Reichenbach filius l.c. 112.

From an examination of the type specimens of the four species cited above I can discover no differences of any consequence. The species is evidently allied to *P. tessellata* Lindl. from which it may be distinguished by the less robust habit, the narrower leaves, the smaller flowers and the lip which has shorter and more obtuse lateral lobes, a thick and more or less bullate middle lobe and no keel or at most a slight thickening at the very base. Florally the species also resembles *P. golungensis* Reichb. f., but that species has thick fleshy V-shaped leaves and a pronounced hair-cushion at the base of the lip. It is probable that *P. Kindtiana* De Wildem. (in Ann. Mus. Congo, ser. 5, 1 (1903) 21) represents a very large form or specimen of *P. modesta*, there being no floral differences.

The distribution of the species is Oubangui-Chari, Uganda, Belgian Congo?, Angola, Northern Rhodesia, Nyasaland and Natal, which is similar to that of *P. tessellata* but less extensive. The species has not yet been found in the Upper Guinea area.

Polystachya melanantha *Schlechter* in Engler Bot. Jahrb. 26 (1899) 341.

Polystachya ionocharis Kraenzlin in Engler Bot. Jahrb. 28 (1900) 371.

Judging by the determination slip on the type specimen of *P. ionocharis* in the Berlin Herbarium, Kraenzlin considered these two to be conspecific. In this monograph (Fedde Repert. Spec. Nov. Beih. 39 (1926) 82, 88, 93) published only a few years after he came to the above decision, he keeps them distinct. There are no floral differences and I cannot see the marked "heteroblasty" and "homoblasty" which Kraenzlin considers to be the decisive difference. So far as can be seen from the type specimens the inflorescence develops in both cases from the young stem before the pseudobulb is formed.

The section *Grandiflorae*, to which this species is referred by Kraenzlin, is one of the least natural of all the sections proposed by him in his monograph. As a result of examination of most of the species included in it, many of them are found to belong to other sections. *P. alpina* Lindl. is better placed in sect. *Calluniflorae; P. inconspicua* Rendle, *P. Doggettii* Rendle & Rolfe and *P. galeata* (Sw.) Reichb.f. (syn. *P. grandiflora* Lindl.) in sect. *Cultriformes; P. Goetzeana* Kraenzl., *P. Lawreneeana* Kraenzl. and *P. kilimanjari* Reichb.f. (described for the first time in the monograph by Kraenzlin and possibly synonymous with *P. Holstii* Kraenzl.) in sect. *Affines; P. reflexa* Lindl. in sect. *Elasticae* and *P. kermesina* Kraenzl. in sect. *Superpositae*.

The remaining species, about eight in all, form a fairly natural group, to which the name *Grandiflorae* could still be suitably applied, since in nearly all the species the flowers are large in relation to the remainder of the plant. But although Kraenzlin does not designate any type species for his sections, the sectional names in most cases are derived from the specific epithet of one of the included species (this is true of eight of the twelve sections proposed by him) and these species may reasonably be looked upon as the type species of their sections. In consideration of the fact that *P. grandiflora* has to be removed to sect. *Cultriformes*, and that the other transferences already referred to alter very considerably sect. *Grandiflorae* as conceived by Kraenzlin, it seems better to give a fresh name to the residuum. In view of the small stature of the species concerned the sectional name *Humiles* seems appropriate. A formal diagnosis is given below.

Polystachya sectio **Humiles** *Summerhayes sect. nov.* Plantae humiles, usque ad 15 cm. altae. *Rhizoma* ± prorepens. *Caules* saepius basi in pseudobulbos proprios inerassati, contigui vel distantes, apice 2–3-phylli. *Racemi* simplices, uni- ad pauciflori. *Flores* pro magnitudine plantarum semper conspicui, galeati mento conspicuo, glabri vel parce pilosi, interdum siccitate nigrescentes, bracteis inconspicuis.

Species circiter 8 adhuc notae, Africae tropicae et australi indigenae.

Species typica sectionis—*P. Ottoniana* Reichb.f.

The new section, which is most closely allied to sect. *Affines*, differs in the smaller average size of the species, the marked development of pseudobulbs, the much narrower and scarcely conspicuous bracts, the much less hairy or glabrous flowers and the long and prominent mentum.

Polystachya (§. **Humiles**) **parva** *Summerhayes sp. nov.*; inter species sectionis floribus parvis, labelli lobo intermedio latissime ovato, lobis lateralibus antice in intermedium breviter decurrentibus lamellas altas formantibus distincta.

Planta epiphytica, parva, usque ad 3.5 cm. alta. *Caules* approximati, basi pseudobulbosi, ad 1 cm. alti, superne 2 3-(rarius 4-) foliati, basi radices flexuosas emittentes; pseudobulbi ovoidei, leviter compressi, usque ad 7 mm. longi et 5 mm. diametro, cataphyllis obtecti. *Folia* ± patentia vel recurvata, ligulata vel lanceolato-ligulata, apice obtusa, breviter aequaliter vel leviter inaequaliter bilobulata, usque ad 3.5 cm. longa, 2.5–7 mm. lata, inferiora valde minora interdum fere ad vaginas redacta. *Inflorescentia* erecta, folia aequans vel superans, simplex, 1–4-flora; pedunculus 7–13 mm. longus, basi vagina (vel rarius 2) circiter 5 mm. longa instructus, ut rhachis breviter pubescens; bracteae lanceolatae, acuminatae, 1.5 3 mm. longae. *Flores* patentes; pedicellus cum ovario 2 3 mm. longus, pubescens. *Sepalum* intermedium incurvatum, lanceolato-ellipticum vel anguste ellipticum, breviter acuminatum, 4 mm. longum, 1.8–2 mm. latum, concavum; sepala lateralia superne patentia, curvatim ovato-triangularia, margine postica prope basin dilatata, breviter acuminata, tota 5.5 mm. longa, basi 3.5 mm. lata, mentum apice breviter cylindricum rotundatum leviter retusum 3.5 mm. longum formantia; omnia sepala sparse pubescentia, ut petala pallide viridescenti-alba. *Petala* incurvata, oblanceolata, apiculato-acuminata, leviter obliqua, circiter 3.5 mm. longa et 1.5 mm. lata, glabra. *Labellum* superne valde recurvatum, e dimidio inferiore cuneato distincte trilobatum, totum 5.5 mm. longum; lobus intermedius latissime ovatus, apice recurvatus acutus leviter canaliculatus, fere 3 mm. longus, circiter 3.25 mm. latus, subcarnosus; lobi laterales basi-

bus parallelis vel antice convergentibus, versus margines subpatentes, parte libera triangulari acuta circiter 1 mm. longa, antice in intermedium breviter decurrentes lamellas altas formantes; discus anguste canaliculatus, callo proprio nullo; labellum pallide flavido-viride. *Columna* semi-teres, 1.5 mm. alta, ut anthera purpureo-brunnea; anthera hemisphaerica; pollinii stipes linearis, 1 mm. longus, viscidium fere orbiculare, 0.2 mm. diametro; fovea stigmatica transverse elliptica.

Northern Rhodesia: Mwinilunga District, Matonchi Farm, on *Brachystegia* trees, Jan., 1938, *Milne-Redhead 4369*; also in evergreen vegetation, *R. Luao.*

The above very striking little species was described from dried specimens and numerous entire specimens in liquid preservative. It is one of the smallest species of the genus as the whole plant is only about 3 cm. high, while the flowers are smaller than usual in sect. *Humiles*. The structure of the lip is very difficult to describe. As is common in many Polystachyas the lip is recurved into a semicircle and cannot be flattened out. The lateral lobes have more or less parallel bases and lean outwards towards their margins at an angle of about 45° forming a V-shaped trough. In front they terminate suddenly with acute slightly connivent apices but instead of forming a simple sinus with the front lobe the inner anticous portions are decurrent for a short distance onto the extremely broad front lobe forming apparent high lamellae somewhat similar to those in *Diplacorchis*.

Polystachya (§. **Affines**) **praecipitis** *Summerhayes sp. nov.*; inter species sectionis sepalis lateralibus valde obliquis, mento angusto cylindrico, labello longiuscule unguiculato distinguenda.

Herba epiphytica, parva, usque ad 8 cm. alta; pseudobulbi contigui, basi angustati, superne ovoidei vel el-

lipsoidei, 1–2 cm. longi, 0.5–1 cm. diametro, vaginis membranaceis obtecti, apice 2–3-phylli, radices flexuosas glabras emittentes. *Folia* anguste oblonga vel elliptico-oblonga, apice breviter bilobulata, inferne articulata, supra articulum 1.5–5 cm. longa, 5–10 mm. lata, dorso humiliter carinata. *Inflorescentia* erecta, simpliciter racemosa, usque ad 7 cm. alta, saepius folia superans; pedunculus usque ad 4.5 cm. longus, ut rhachis subdense pubescens, inferne cataphyllis tribus, medio cataphyllo singulo, omnibus scariosis ± vaginantibus instructus; racemus 1–3 cm. longus, laxe 3–5-florus; bracteae ovatae, acuminatae, subscariosae, usque ad 4 mm. longae, floribus multo breviores. *Flores* cremei, deflexi; pedicellus brevissimus, ovario 2–4 mm. longo dense patentim albido-piloso. *Sepalum* intermedium elliptico-lanceolatum, breviter acuminatum, 7 mm. longum, 3 mm. latum; sepala lateralia valde oblique oblongo-lanceolata, apice subacuta, basi margine postico rotundato-dilatata, tota 11 mm. longa, 3 mm. lata, cum pede columnae mentum angustum cylindricum rotundatum 3–4 mm. longum formantia; omnia sepala extus pubescentia. *Petala* leviter curvatim lanceolato-oblonga, acuta, 6 mm. longa, 1.5 mm. lata, glabra. *Labellum* ex ungue longiusculo ligulato fere 4 mm. longo subhastatum, totum 11 mm. longum, 3.5–4 mm. latum; lobi laterales breves, obtusi, ab intermedio vix sejuncti; lobus intermedius acutus, 4 mm. longus, 3 mm. latus, prope apicem marginibus ± involutis, pulvino pilorum articulatorum flavidorum fere omnino obtectus; discus et unguis intus pilis sparsis patentibus praeditus. *Columna* brevis, fere teres, vix 2 mm. alta; androclinium leviter excavatum; fovea stigmatica transverse elliptica.

Tanganyika Territory: Handeni District, Nyogi Mt., 1050 m. alt., forest margin on summit of great rocks [precipice], Sept., 1933, *Burtt 4874*.

This species, which was growing with *P. isochiloides* Summerh. (see Bull. Misc. Inform. Kew 1939, p. 498), seems naturally placed in sect. *Affines* on account of the habit, inflorescence and hairy flowers. The flower is, however, much narrower than in other species and possesses a very distinct and shortly cylindrical mentum. The lip is also very characteristic, having a triangular-lanceolate or subhastate blade and narrow parallel-sided claw; the front lobe is almost entirely covered by a dense cushion of the floury articulate hairs so common in the genus.

Polystachya fusiformis (*Thouars*) *Lindley* in Bot. Reg. 10 (1824) sub t. 851.

Polystachya minutiflora Ridley in Journ. Linn. Soc. Lond. Bot. 20 (1883) 330.

Polystachya composita Kraenzlin in Fedde Repert. Spec. Nov. Beih. 39 (1926) 103—Summerhayes in Hutchinson & Dalziel Fl. West Trop. Afr. 2 (1936) 429.

From careful examination of the above I am unable to discern any but individual differences, the various specimens showing a range of characters such as is to be expected from a species with such a wide geographical distribution. I have seen specimens from Fernando Po, Cameroons, Uganda, Tanganyika Territory, Belgian Congo, Northern Rhodesia and Madagascar. I do not find any segregation of character combinations justifying the retention of *P. minutiflora* as a distinct species, the characters given by Schlechter (Fedde Repert. Spec. Nov. Beih. 33 (1924) 159) showing no correlation in the various specimens examined. Kraenzlin's key character (l.c. pp. 100, 101) of presence or absence of a mentum for separating *P. composita* from *P. fusiformis* appears to me to be entirely imaginary. In spite of the somewhat

different appearance of the plant figured by Thouars (Fl. Iles Austr. Afr. t. 86: 1822) the Réunion plant does not appear to differ essentially from those found elsewhere either in habit or in floral structure.

Polystachya cultriformis (*Thouars*) *Sprengel* Syst. Veg. 3 (1826) 742.

Polystachya appendiculata Kraenzlin in Notizbl. Bot. Gart. Berl. 3 (1903) 238, probably.

Polystachya Lujae De Wildeman in Plant. Nov. Hort. Then. (1904) t. 18.

Careful examination of the description of *P. appendiculata* Kraenzl., the type specimen of which could not be found at Berlin, taken in conjunction with numerous specimens referred to *P. cultriformis* (Thou.) Spreng. in the Kew Herbarium, has led me to the conclusion that these two are probably conspecific. The only outstanding feature in the description of Kraenzlin's species, namely, the appendix at the base of the dorsal sepal, has been found on a number of specimens from the Gabon, Uganda, and even Madagascar (*Perrier de la Bathie 16062*). This appendix, however, is developed to different extents, being sometimes over 1 mm. long while in other cases it is just a small knob. I have been unable to correlate its presence or absence with any other of the variations of the widespread and variable *P. cultriformis*. *P. Lujae* De Wildem., though placed apart from *P. cultriformis* by Kraenzlin in his monograph, appears to be indistinguishable from the latter, particularly the Mascarene Islands specimens.

Polystachya gracilenta *Kraenzlin* in Engler Bot. Jahrb. 19 (1894) 251.

Polystachya purpureo-alba Kraenzlin l.c. 43 (1909) 337.

In spite of the alleged differences between the above

species set out by Kraenzlin in his key to sect. *Cultriformes* (Fedde Repert. Spec. Nov. Beih. 39 (1926) 106), I can see none of any importance on examining the two type specimens. It is evident from the labels that the two gatherings were made in the same region and altitudinal zone.

Polystachya bicarinata *Rendle* in Journ. Linn. Soc. Lond. Bot. 38 (1908) 236.

Polystachya cuspala Kraenzlin in Wiss. Ergebn. Deutsch. Zentr.-Afr.-Exped. 1907-1908, 2 (1910) 79, t. IX, fig. C.

Dissections of flowers from the type specimens of the above "species" show them to be almost identical. There appear to be no differences, either floral or vegetative, warranting their separation.

Polystachya galeata (*Swartz*) *Reichenbach filius* in Walpers Ann. 6 (1863) 637.

Polystachya Gilletii De Wildeman Not. Pl. Util. Congo (1904) 313.

The type gathering of *P. Gilletii* De Wildem. agrees well with *P. galeata* in general features and floral structure. The leaves are somewhat wider, the flowers are a little smaller, while the petals are broader. Judging from other species in this section and elsewhere in the genus, none of these differences is of specific value. It is interesting to note that Kraenzlin makes no comparison between these species in his monograph since he places *P. galeata* in his sect. *Grandiflorae* and *P. Gilletii* in sect. *Cultriformes*. The latter section is the correct position.

Polystachya (§. **Cultriformes**) **virginea** *Summerhayes sp. nov.*; a *P. Doggettii* Rendle & Rolfe mento longiore, a *P. galeata* (Sw.) Reichb.f. planta siccitate haud nigrescente, labello vix unguiculato, ab utraque floribus candidis differt.

Planta epiphytica, usque ad 40 cm. alta, fere omnino glabra. *Caules* (vel pseudobulbi) contigui, erecti, anguste cylindrici vel anguste fusiformes, ancipites, usque ad 15 cm. longi, 0.5–1 cm. diametro, apice monophylli, basi cataphyllis lanceolatis usque ad 10 cm. longis vaginati, radices flexuosas emittentes. *Folium* oblongo-ligulatum vel elliptico-ligulatum, apice brevissime aequaliter bilobulatum vel apiculatum, 10–27 cm. longum, 0.9–3.6 cm. latum, basi breviter conduplicatum. *Inflorescentia* folio multo brevior, usque ad 10-flora; pedunculus 2.5–8 cm. longus, teres, vagina lanceolata submembranacea omnino vel fere omnino circumdatus; racemus 1–4 cm. longus; bracteae parvae, triangulares, acuminatae, usque ad 2.5 mm. longae. *Flores* adscendentes, candidi, pulchri; pedicellus 3–5 mm. longus; ovarium 10–12 mm. longum. *Sepalum* intermedium lanceolatum, acutum vel subacutum, 8.5–10.5 mm. longum, 4.5–5 mm. latum; sepala lateralia oblique triangularia, breviter acuminata, margine postico (superiore) 15–17.5 mm. longo, pedi columnae adnata mentum galeiforme 8.5–11 mm. longum formantia; omnia sepala 5–7-nervia. *Petala* oblique oblanceolato-oblonga, apice subacuta, 8–10 mm. longa, 3–4 mm. lata, 3–5-nervia. *Labellum* fere sessile, valde curvatum, e basi latiuscula ambitu obovatum, dimidio apicali ± distincte trilobatum, 13–14 mm. longum, 8.5–10 mm. latum; lobus intermedius triangularis, leviter acuminatus, 4.5–5 mm. longus, 4–5 mm. latus; lobi laterales rotundati vel obtusi; discus callo quadrato antice altiore instructus. *Columna* crassa, obtusa, 3 mm. longa, 3.6 mm. diametro, androclinio leviter excavato.

Uganda: Kigezi, Impenetrable Forest, 2100 m. alt., Sept. 1936, *Eggeling 3308*; Toro, Bwamba Pass, 2400 m. alt., August 1937, *Eggeling 3361* (Type).

A very striking species with handsome pure white flowers. The nearest relative is apparently *P. Doggettii*

Rendle & Rolfe, which occurs on Mt. Ruwenzori but has pale yellow flowers with a shorter mentum.

Polystachya Doggettii *Rendle & Rolfe* in Journ. Linn. Soc. Lond. Bot. 38 (1908) 235.

Polystachya Schinziana Kraenzlin in Fedde Repert. Spec. Nov. Beih. 39 (1926) 119.

Curiously enough *Kassner 3127*, which is cited on page 119 of Kraenzlin's monograph as the basis of his new species, *P. Schinziana*, is also cited on page 82 under *P. Doggettii* Rendle & Rolfe. Like *P. galeata* (Sw.) Reichb. f., the present species is placed correctly in sect. *Cultriformes*, being closely allied to its West African congener. It differs in the smaller flowers, the shorter mentum and the differently shaped lip, the claw being short and broad, the lateral lobes rounded and not clearly separated from the middle lobe, while the middle lobe itself has a prominent recurved acute apex. The lip, as remarked by Kraenzlin, is very difficult to flatten out, assuming different outlines according to the way it is flattened.

Polystachya inconspicua *Rendle* in Journ. Linn. Soc. Lond. Bot. 37 (1905) 218.

Polystachya ashantensis Kraenzlin in Bull. Misc. Inform. Kew (1926) 294.

On examination it appears that the type specimens of the above possess no differences of specific importance, the main differences being those of size, both vegetatively and florally. The type of *P. inconspicua* seems to be a very small specimen bearing exceptionally large flowers. Mr. W. J. Eggeling, however, has collected many specimens in Uganda showing all intermediates between *Bagshawe 425* and the Gold Coast material as regards vegetative characters; these specimens also help partially to bridge the differences in flower size. The species evi-

dently belongs to sect. *Cultriformes* being a close relative to *P. tenuissima* Kraenzl.

Polystachya (§. **Cultriformes**) **tenella** *Summerhayes sp. nov.*; affinis *P. Mildbraedii* Kraenzl. et *P. angustifoliae* Summerh., ab illa floribus multo minoribus, ab hac labello latiore, ab utraque habitu et praesertim pedunculo graciliore, floribus magis congestis, labello ex ungue angusto subcordato-triangulari fere integro distinguitur.

Herba epiphytica, 25–36 cm. alta; caules gracillimi, laxe caespitosi, fere erecti, teretes, leviter longitudinaliter striati, 5–15 cm. longi, 0.5–2 mm. diametro, apice monophylli, inferne cataphyllis tubulosis ± arcte tunicati, radices flexuosas emittentes. *Folium* erectum, lineare vel ligulato-lineare, obtusum, leviter bilobulatum, 10–20 cm. longum, 2–5.5 mm. latum. *Inflorescentia* gracillima, folia fere aequans vel superans, simpliciter racemosa vel ramulis paucis instructa; pedunculus 10–18 cm. longus, basi fere 1 mm. diametro, basi vagina arcta tunicatus; pars florifera 1–5 cm. longa, usque ad 15-flora, ramulis suberectis usque ad 1.5 cm. longis; rhachis flexuosa; bracteae 1–2 mm. distantes, ancipites, e basi lata acuminatae, 1–2 mm. longae. *Flores* erecto-patentes, partim lutei partim purpurei; pedicellus 1.5–2 mm. longus; ovarium 1.5 mm. longum. *Sepalum* intermedium oblongo-ellipticum, obtusum vel rotundatum, 2.8–3.5 mm. longum, 1.8–2 mm. latum, trinervium; sepala lateralia oblique triangularia, subacuta, 3.5–4 mm. longa, cum pede columnae mentum obtusum 2.5–3 mm. longum formantia. *Petala* anguste ligulata, subacuta, 2.6–3.2 mm. longa, 0.4–0.5 mm. lata, uninervia. *Labellum* ex ungue angusto leviter concavo 0.7–1 mm. longo subcordato-triangulare, fere integrum, lobis lateralibus vix distinctis rotundatis, apice obtusum, totum 3.5–4.2 mm. longum, 2.5–3 mm. latum, ecallo-

sum. *Columna* semiteres, 2.5 mm. alta, androclinio leviter excavato, pede 3 mm. longo; anthera transverse elliptica, convexa, apice breviter apiculata.

Belgian Congo: Virunga Mts., Namlagira, eastern slope, 2250 m. alt., common in forest, Jan. 1931, *Burtt 3132* (Type).
Uganda: Kigezi, Sept. 1936, *Eggeling 3262*.

A further species belonging to the group within sect. *Cultriformes* possessing long slender stem-like pseudobulbs and narrow leaves. The flowers are grouped in short 5 10-flowered racemes of which there may be only one or several close together. Many of these branch racemes fail to develop, being represented by buds in the axils of the lower bracts.

Polystachya (§. **Cultriformes**) **subdiphylla** *Summerhayes sp. nov.*; ab omnibus aliis speciebus sectionis pseudobulbis brevibus ampullaceo-conicis, cataphyllo supremo foliaceo fere folium secundum formanti, folio anguste oblanceolato 2–5 cm. supra pseudobulbum disarticulato, racemo brevissimo paucifloro differt.

Herba terrestris, 20–35 cm. alta, fere omnino glabra; radices flexuosae, 1–2 mm. diametro; pseudobulbi contigui vel fere contigui, basi sympodium breve repens formantes, superne erecti, ampullaceo-conici vel anguste ovoideo-conici, 2–4 cm. alti, 5 10 mm. diametro, apice monophylli, cataphyllis 2 3 suprema foliacea apice triapiculata pseudobulbum valde superantia et folii basin arcte vaginantia vestiti. *Folium* anguste oblanceolatum vel ligulato-oblanceolatum, apice acutum vel subacutum, basi sensim angustatum, 2–5 cm. supra apicem pseudobulbi articulatum, supra articulum 15–25 cm. longum, 11–17 mm. latum. *Inflorescentia* folio brevior; pedunculus teres, laevis, 8–16 cm. longus, ebracteatus; racemus brevissimus, fere capitatus, rachide 1–2 cm. longa, usque ad 4-florus. *Flores* adscendentes, albi, labello rubro- et

flavo-signato; pedicellus cum ovario 1–1.6 cm. longus. *Sepalum* intermedium lanceolatum, acuminatum, circiter 1.5 cm. longum et 5.5 mm. latum, 5-nervium; sepala lateralia recurvatim patentia, oblique ovato-triangularia, breviter caudato-acuminata, circiter 1.5 cm. longa, 9 mm. lata, basi pedi columnae adnata mentum 7 mm. longum formantia. *Petala* oblanceolata, breviter acuminata, 1.25 cm. longa, 4–4.5 mm. lata. *Labellum* superne valde recurvatum, vix unguiculatum, trilobatum, 1–1.2 cm. longum, 1.1–1.2 cm. latum; lobus intermedius transverse ellipticus, apice dorsaliter longe apiculatus, 5–6 mm. longus, 6.5–7 mm. latus, pilis flavidis vestitus; lobi laterales ± erecti, incurvatim subovati, rotundati, parte libera 3–4 mm. longa et 4–5 mm. lata, rubro-striati; discus callo humili ligulato apice obtuse triangulari instructus. *Columna* brevissima; anthera galeiformis, crista integra laevi coronata.

Tanganyika Territory: Uluguru Mts., Morogoro, Kinolo Road, 1890 m. alt., in dwarf "mtani" forest, April 1935, *Bruce 982*.

A very striking species which I have placed in sect. *Cultriformes* on account of the one-leaved pseudobulbs, but which seems to have no close allies there. The flowers resemble more closely those of sect. *Affines* but only the lip is hairy. Interesting features are the very long upper sheath which is wrapped round the base of the leaf and seems almost to be a further half-developed leaf, and the articulation of the leaf itself which is at least 2 cm. above the apex of the pseudobulb. On the falling of the blade, the base, which is 2–5 cm. long, remains attached to the pseudobulb. In other species of sect. *Cultriformes* this persistent leaf-base is never more than about 5 mm. long and is usually much shorter.

Polystachya (§. **Cultriformes**) **aconitiflora** *Summerhayes sp. nov.*; affinis *P. caespitificae* Kraenzl., a qua

caulibus gracilioribus, foliis angustioribus, labelli lobis lateralibus quam intermedio multo minoribus, lobo intermedio subquadrato rotundato disco calloso distinguitur.

Planta epiphytica, parva, usque ad 12 cm. alta. *Caules* (vel pseudobulbi) caespitosi, cylindrici, graciles, siccitate longitudinaliter sulcati, usque ad 6 cm. longi, 0.5–1 mm. diametro, inferne vaginis 2–3 tubulosis subarcte circumdati, basi radices flexuosas glabras emittentes, apice monophylli. *Folium* lineari-ligulatum, apice rotundatum, basi leviter angustatum, 2.5–6 cm. longum, 2–4 mm. latum. *Inflorescentia* quam folium brevior vel id superans; pedunculus gracilis, 1.5–5 cm. longus, basi vagina arcta circumdatus; racemus abortu fere semper uniflorus, 5–10 mm. longus, bracteis 3–6 distichis lateraliter compressis acuminato-ovatis usque ad 2.5 mm. longis. *Flores* suberecti, galeiformes, purpurei vel partim purpurei partim albi; pedicellus cum ovario 3–5 mm. longus. *Sepalum* intermedium late elliptico-lanceolatum, acuminato-apiculatum, 4 mm. longum, 2 mm. latum, subquinquenervium; sepala lateralia oblique ovato-triangularia, apiculata, margine postico 5.7–7 mm. longa, basi cum pede columnae mentum subobtusum 4–5 mm. longum formantia. *Petala* oblanceolata, acuta, 3–3.7 mm. longa, 1.1–1.5 mm. lata, uninervia. *Labellum* basi cuneatum, medio vel supra medium trilobatum, 5.5–6.5 mm. longum, 4–4.6 mm. latum; lobus intermedius subquadratus, apice rotundatus vel obtusus, inerassatus, 1.7–2.4 mm. longus, 2.3–2.6 mm. latus; lobi laterales rotundati usque subacuti, quam intermedius minores, brevissimi, circiter 1 mm. lati; discus callo elliptico-quadrato humili obtuso instructus. *Columna* semi-teres, truncata, circiter 1.5 mm. longa, androclinio leviter excavato, fovea stigmatica ambitu semi-orbiculari; anthera et pollinia non visa.

Belgian Congo: Lava Plain, north of Lake Kivu, Aug. 1908, *Kassner 3236* (Type).

Uganda: Kigezi, Sept. 1936, *Eggeling 3237*; Kigezi, Nyebeya, Impenetrable Forest, Oct. 1940, *Eggeling 4142*.

A rather charming little species intermediate vegetatively between *P. caespitifica* Kraenzl. and *P. vulcanica* Kraenzl., but differing from the former in the lip shape and the colour of the flowers and from the latter in the broader leaves and considerably smaller flowers.

Polystachya (§. **Cultriformes**) **latilabris** *Summerhayes sp. nov.*; a *P. caespitifica* Kraenzl. foliis majoribus, inflorescentiis plurifloris, floribus majoribus et colore diverso differt.

Herba epiphytica, usque ad 15 cm. alta, omnino glabra; caules (vel pseudobulbi) erecti, contigui, 2.5–5.6 cm. longi, inferne 1–2 mm. diametro, inferne vaginis duabus tubulosis acutis circumdati, basi radices flexuosas emittentes, apice monophylli. *Folium* elliptico-ligulatum, apice brevissime rotundato-bilobulatum, inferne angustatum, basi per 6–7 mm. longum pedunculum arcte vaginans, apice vaginae articulatum, totum 5–9.5 cm. longum, 5–9 mm. latum, crassiusculum. *Inflorescentia* folio brevior, erecta; pedunculus basi anguste superne magis anceps, 3.5–5 cm. longus; racemus brevis, usque ad 6-florus, 1.5–2 cm. longus; bracteae fere distichae, acuminato-triangulares, 1–2 mm. longae. *Flores* patentes; pedicellus (ovario incluso) circiter 5 mm. longus. *Sepalum* intermedium ovato-ellipticum, apiculatum, 5.3–6.2 mm. longum, 3.5–3.8 mm. latum, tri- vel subquinquenervium; sepala lateralia oblique ovata, breviter apiculato-acuta, margine postico 6.6–7.2 mm. longo, cum pede columnae mentum subacutum 4.5 mm. longum formantia. *Petala* spathulato-obovata, apice apiculata vel breviter acuminata, 5.3 mm. longa, 2.6–3.6 mm. lata. Labellum breviter unguiculatum, ambitu transverse ellipticum, 5.3–5.6 mm. longum, 10–10.2 mm. latum, triente apicali fere

aequaliter trilobatum; lobus intermedius triangulari-semiorbicularis, apiculatus, 2 mm. longus, 3.6–4 mm. latus; lobi laterales erecti, oblique et incurvatim subquadrato-ovati, 2 mm. longi, 3–3.5 mm. lati; discus ecallosus. *Columna* subteres, apice truncata, 1.6–2 mm. alta, 1.5–2 mm. diametro; androclinium satis excavatum, anthera fere hemisphaerica antice subacuta; fovea stigmatica transverse elliptica.

Kenya Colony: Kericho, 1950 m. alt., March 1933, *Gray 90*, cult. & comm. May 2nd., 1939 (Type). "Flowers white with orchid-coloured throat and orange line in centre of labellum; anther orchid-coloured." Tuso, Eastern Aberdare Mts., in forest, April 1935, *Napier 3652*. "Flowers creamy-white with mauve 'lip' and a spot of orange on yellow on upper lip."

This pretty little species is apparently closely allied to *P. caespitifica* Kraenzl. which, however, is said to have "intense yellow" flowers, and also differs by the characters given in the diagnosis. The most striking feature of *P. latilabris* is the very broad lip with large erect side lobes which, although equalling the middle lobe in length, are somewhat greater in area. Unfortunately the lip of the only flower on the type sheet of *P. caespitifica* has been lost, and Kraenzlin's description is not adequate to convey a true picture of the structure of this important floral organ. Judging by the description it may well resemble that in *P. latilabris*, being ecallose in each case. Further collections of *P. caespitifica* from the original locality are much desired, since it is the first described species of the small group to which it belongs.

Polystachya dendrobiiflora *Reichenbach filius* Otia Bot. Hamburg. (1881) 76.

Polystachya longiscapa Summerhayes in Bull. Misc. Inform. Kew (1934) 211.

Further consideration makes it evident that these two are conspecific. It should be noted that the inflorescence

is often branched, the branches being up to 7 cm. long; some or all of these branches may, however, be arrested in the bud-stage but are always discernible. This non-development of lateral inflorescence-branches is a common feature in the genus and has been the cause of some confusion in the past (see Bull. Misc. Inform. Kew 1935, p. 197).

BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, OCTOBER 30, 1942 VOL. 10, NO. 10

PLANTAE COLOMBIANAE II

BY

RICHARD EVANS SCHULTES

YOCO: A STIMULANT OF SOUTHERN COLOMBIA

THE NUMBER OF SPECIES used as narcotics and stimulants by the Indians of Middle and South America is comparatively small. Nevertheless, the botanical source of several, until recently, has remained doubtful or unknown. During the last twenty-five years, extensive research in the identification of narcotics and stimulants has been carried out. As a result, at the present time, nearly all of the species which are used have been identified.

One of the few important exceptions is the remarkable *yoco* which has long been employed as a stimulant by the Indians of a small part of southern Colombia and the adjacent regions of Ecuador and Peru.

During the course of ethnobotanical studies in the Putumayo, Colombia,[1] in 1941 and 1942, I found that the most important non-alimentary plant in the economy of the natives of the tropical areas is yoco. The flowering of the yoco plant—an extensively climbing liana—is apparently sporadic and capricious, and it was possible to collect fertile material only after months of search. Infrequency of flowering is probably one of the reasons for the neglect by botanists of this important economic plant.

"Plantae Colombianae I" was published in Caldasia 1 (1942) 19-24.

[1] Carried out under the auspices of the National Research Council, Washington, D.C.

While there is a possibility that yoco comprises several species, the only one known to be used in the Putumayo among the Inga, Siona and Kofán Indians represents an undescribed species of the sapindaceous genus *Paullinia* which is herewith described. It has been thought appropriate to employ as a specific epithet the common name by which the plant is known in the area where its use as a stimulant is practiced.

I. Description of yoco

Paullinia Yoco *Schultes & Killip sp. nov.*

Frutex scandens, extensus, robustusque. Rami robusti, basi usque ad 12 cm. in diametro, lactiferi, lacte albo astringentique, nigro cum cortice lenticellato scabroque. Ramuli subteretes, obtuse angulati et fibroso-striati, ferruginei, scabridiusculi, minute pulverulento-puberuli denique subglabrescentes, internodiis brevibus, pampinis robustis frequentibusque, circinalibus, denique valde crasso-ligneis. Folia plerumque quinque-pinnata, usque ad 35 cm. (rarissime usque ad 45 cm.) longa, fere aequaliter lata. Rhachides nudae, (exalatae), firmae, leviter fibroso-striatae, ferrugineae, parce puberulae, 6–20 cm. longae, 2–3 mm. in diametro, quattuor-sulcatae. Foliola majora, elliptica, 15–25 (plerumque plus minusve 20) cm. longa, 8–11 cm. lata, superiora plus minusve obovata, apice breviter acuminata acumine obtuso, margine integerrima, coriaceo-chartacea, utrinque glabra, subsessilia (petiolis nudis, usque ad 5 mm. longis, plus minusve 2 mm. in diametro), viva utrinque atroviridia, subtus nitida (in sicco flavo-fulva), clathrato-venosa, lateralibus cum nervis septem ad novem supra impressis subtus prominenter et valde elevatis, nervo praecipuo utrinque minutissime scabridiusculo-puberulo. Thyrsi solitarii, sparsissime et minute pulverulento-puberuli, robusta cum rhachide 7–25 (plerumque 10–15) cm. longa et 3 mm. in diametro,

saepe basi contracta. Inflorescentia axillaris, racemiformis, rarenter bifurcata, multi- (usque ad 250-) flora, aliquid cincinnalis, 4–10 (plerumque plus minusve 8) cm. longa. Pedicelli comparate robusti, 3–8 (plerumque 5–6) mm. longi, minute sed densius hirtello-pilosi, gracilibus cum bracteis minutissimis acuminatissime linguiformibus vel triangulari-subulatis, dense hirtello-pilosulis. Flores parvi sed satis robusti, albo-flavidi, aliquid mucosi. Sepala quinque; sepala duo exteriora subcoriacea, extus tomentulosa, intus glabra, subovalia, apice rotundata, plus minusve 1.8 mm. longa et 1.2 mm. lata, margine pseudofimbrillifera vel villoso-ciliata; sepala interiora tria majora, satis membranacea, rotundata, intus glabra, plus minusve 2.8 mm. longa, fere aequaliter lata, valde inflexis cum marginibus sparse villosiusculis. Tori glandulae minutae linguiformes, dense pilosae. Petala quattuor, submembranacea, integra, obovata, intus minute pilosiuscula, 2.3 mm. longa, 2 mm. lata, margine non villosiuscula. Stamina octo, circa pistillum inserta, ex floribus haud exserta. Staminum filamenta complanata, pilis albis longioribus lanatisque extus vestita, 1 mm. longa. Antherae glabrae, 0.7 mm. longae. Ovarium globosum, glabrum, plus minusve 1 mm. in diametro, crasso cum stylo glabro in circuitu triangulari, 0.6 mm. lato, 1 mm. longo; stigma profunde (usque ad 0.3 mm.) trifidum lobis crassis. Fructus capsularis, trivalvis, subdrupaceus, in maturitate rubens, gustatu astringens amarusque; capsula oblique ovoidea, in stipitem attenuata, rostrata (styli reliquiis coronata), ecostata et exalata, epicarpio parum crasso, praeter stipitis basim glabra (capsula sicca valde crustacea, superficie laevigata enervia ecostataque), 10–14 mm. longa, 4–7 mm. lata, rostro usque ad 2 mm. longo. Semina globosa, quasi omnino arillata.

Extensive, woody liana. Stems stout, up to 12 cm. in diameter at the base, with a milky-white astringent

EXPLANATION OF THE ILLUSTRATION

PLATE XXVII. PAULLINIA YOCO *Schultes & Killip*. 1, plant, one half natural size. 2, woody tendril, one half natural size. 3, flower, five times natural size. 4, sepal (large), five times natural size. 5, petal, five times natural size. 6, pistil, five times natural size. 7, stamen, five times natural size. 8, fruit with pedicel, two and one-half times natural size.

Plate XXVII

sap. Branchlets subterete, obtusely angled, striate, ferruginous, minutely pulverulent-puberulent becoming almost glabrous, with circinate tendrils which become woody. Leaves usually 5-foliolate. Axes exalate, 4-sulcate, strong, ferruginous, slightly puberulent. Leaflets elliptic (the upper obovate, obtusely acuminate, the lower rotundate), 15–25 cm. long, 8–11 cm. wide, entire, coriaceous-chartaceous, glabrous on both sides, clathrate-nerved with seven to nine nerves. Inflorescence axillary, racemiform, many-flowered, circinate. Pedicels minutely hirtellous, with very small bracts which are acuminately linguiform or triangular-subulate. Sepals five; the outer two subcoriaceous, externally tomentulose, internally glabrous, almost oval, apically rounded with a villose-ciliate margin; the inner three larger, membranaceous, rounded, internally glabrous. Petals four, submembranaceous, entire, obovate, internally minutely pilose. Stamens eight, not exserted, with strong complanate filaments which are covered with white woolly hairs. Ovary globose and glabrous with a fleshy style and a trifid stigma. Fruit subdrupaceous, red when ripe, obliquely ovoid, rostrate.

SPECIMENS EXAMINED:

COLOMBIA: Comisaría del Putumayo, Río Putumayo, Puerto Ospina, 15 kilometros adentro en la trocha Puerto Ospina—Puerto Asís; alt. ca. 300 m., 6 julio, 1942, *Richard Evans Schultes 4028* (TYPE in Econ. Herb. Oakes Ames Nos. 10432 and 10433, sheets I and II; DUPLICATE TYPES in Herb. Nac. Colomb.; U.S. Nat. Herb.; Herb. Gray).

Comisaría del Putumayo, Umbría, 0° 54′ N., 76° 10′ W., alt. 325 m., forest, January-February 1931, *G. Klug 1933*, "blanco yoco" (U.S. Nat. Herb. No. 1518079); same locality and date *G. Klug 1935*, "huarmy yoco," (U.S. Nat. Herb. No. 1518082).

The following sterile specimens have been examined and found to be referable to *Paullinia Yoco:*

Comisaría del Putumayo, Río Putumayo, Piñuna Negra, alt. 240 m., diciembre, 1940, *J. Cuatrecasas 10708* (Herb. Nac. Colomb.; U.S. Nat. Herb.).

Comisaría del Putumayo, alta cuenca del Río Uchupayaco, al suroeste de Puerto Limón, alt. 300 m., 27–28 febrero, 1942, *Richard Evans Schultes 3341*; Río Putumayo, Puerto Ospina y los alredadores, alt. ca. 250 m., 23–25 marzo, 1942, *Richard Evans Schultes 3426;* Río San Miguel ó Sucumbíos, Conejo y los alredadores, en frente de la Quebrada Conejo, alt. ca. 300 m., 2–5 abril, 1942, *Richard Evans Schultes 3543*, "yoco colorado" (all in Herb. Nac. Colomb. and in Econ. Herb. Oakes Ames).

Comisaría del Putumayo, Mocoa y los alredadores al norte, alt. 750–850 m., 3–7 diciembre, 1941, *Richard Evans Schultes & C. Earle Smith 3045* (Econ. Herb. Oakes Ames).

Comisaría del Putumayo, Umbría, 0° 54′ N., 76° 10′ W., alt. 325 m., January–February 1931, *G. Klug 1930*, "verde yoco" (U.S. Nat. Herb. No. 1518076); same locality and date, *G. Klug 1937*, "taruco yoco" (U.S. Nat. Herb. No. 1518083); same locality and date, *G. Klug 1946*, "yagé yoco" (U.S. Nat. Herb. No. 1518085); same locality and date, *G. Klug 1947*, "canangucho yoco" (U.S. Nat. Herb. No. 1518086).

Ecuador: Río San Miguel ó Sucumbíos, entre el Río Putumayo y la Quebrada Teteyé, alt. 260 m., "yoco colorado," 29 marzo, 1942, *Richard Evans Schultes 3476* (Econ. Herb. Oakes Ames).

Paullinia Yoco belongs to the section *Enoureа* (Aubl.) Radlk. of the genus according to Radlkofer's recent treatment of the Sapindaceae (Pflanzenr. IV, 165 (1931) 232—Sapindaceae I). This section contains eight species, all rather closely allied and all from northern South America (the Guianas, northwestern Brazil, southern Colombia and Peru). *Paullinia Yoco* appears to be most closely related to *P. clathrata* Radlk. of the Amazonas of Brazil, a region floristically very like the Colombian Amazonas and Putumayo where the new species is native. *Paullinia clathrata* (according to descriptions and a photograph of the type) differs from *P. Yoco* in being much larger vegetatively, in having subdentate instead of entire leaves, and in having leaf-pubescence. There are also several floral characters which serve to separate the two species. In Radlkofer's key to the section *Enoureа*, the type material of *Paullinia Yoco* traces out to *P. conduplicata* (Klotzsch) Radlk. However, *Paullinia Yoco* is distin-

guished from *P. conduplicata* by its very much smaller size, by the type of its pubescence, and by several floral characters.

II. The identification of yoco

Curiously enough, yoco has been given relatively little attention in anthropological and botanical writings. The earliest attempt to identify yoco botanically was apparently that of Dr. Florent Claes of Brussels who made a trip to the Caquetá, Colombia, in 1925 to investigate *yajé* (*Banisteriopsis* spp.) and *yoco*. Dr. Claes made several excursions with Fray Gaspar de Pinell, then a Capuchin missionary in the Putumayo-Caquetá-Amazonas region, and succeeded in collecting a quantity of stems of yoco for chemical analysis and flowering specimens of the plant for taxonomic study. Fray Gaspar, writing in 1929 of Claes' work (Gaspar de Pinell: "Excursión apostólica por los Ríos Putumayo, San Miguel de Sucumbíos, Cuyabeno, Caquetá y Caguan" (1929) 168), said (*translated*):

> Dr. Claes was very much interested in trying to classify *yajé* and *yoco* with scientific accuracy; this was the main object of his trip. However, since the flowers of these plants are almost microscopic, he had to content himself merely by collecting several specimens of them to examine under powerful microscopes . . . . Relative to *yoco*, he writes me the following: 'The yoco is more than probably a member of or at any rate very near to the family *amfelidias* [sic].'

The material which Claes took back to Europe for chemical studies was analyzed and the results were published before the accompanying herbarium specimens were identified. In 1926, Michiels and Denis ("Sur la liane yocco, drogue à caféine du genre '*Paullinia*,'" Bull. Acad. Roy. Méd. Belg. sér. 5, 6, vii (1926) 424) referred yoco to the genus *Paullinia*. Later, however, de Wildeman ("Sur le yocco, plante à caféine originaire de Colombie" Compte Rend. 183 (1926) 1350) published a note on

Claes' specimens, stating that, with the help of the Royal Botanic Gardens at Kew, he had been able to determine yoco as *Paullinia scarlatina* Radlk.

According to Radlkofer's monographic treatment of the *Sapindaceae*, *Paullinia scarlatina* does not occur in South America and, in fact, is known only from the provinces of Izabál and Alta Verapaz in Guatemala. It therefore seems quite probable that Claes' material was wrongly determined. It is unfortunate that this mistaken identification has found its way into chemical literature. So far as I have been able to ascertain, Radlkofer does not cite Claes' collections in his monograph. It is impossible to borrow this material for study, but I feel certain that it will be found to be referable to *Paullinia Yoco.*

In 1931, Señor Guillermo Klug,[2] a collector from Iquitos, Peru, explored the Colombian Putumayo. He made an extensive study and several very excellent collections of yoco in the Inga Indian town of Umbría. Klug's collections of yoco, two of which are fertile, are all referable to *Paullinia Yoco.*

Dr. José Cuatrecasas, of the Instituto de Ciencias Naturales, Bogotá, carried out extensive botanical work, in the Putumayo in 1940. Among Cuatrecasas' material is a sterile collection of yoco from Puerto Piñuna Negra on the Río Putumayo. This collection is likewise referable to *Paullinia Yoco.*

It is possible that another species of *Paullinia* may be employed as yoco. In the Herbario Nacional Colombiano, there is preserved a sterile specimen from the upper Caquetá region (*E. Perez-Arbelaez sin. num.*) identified as *Paullinia pterophylla* Tr. & Planch. The collector made an annotation that this species represents the source of

[2] I am greatly indebted to Mr. Ellsworth P. Killip of the Smithsonian Institution for permission to study Klug's specimens and for placing at my disposal Klug's unpublished notes on *yajé* and *yoco.*

the yoco which the Indians of the upper Caquetá utilize medicinally as a febrifugal tonic.

The Indians of the Caquetá and Putumayo apparently distinguish between different "kinds" of yoco, but I am unable to account for the differences. Nearly forty years ago, Rafael Zerda Bayon ("Informe del jefe de la expedición científica del año de 1905 a 1906. Lista de las muestras de productos del Caquetá y que podrán ser artículos de exportación." (1906) Bogotá), writing briefly on yoco in his report on a scientific expedition to the Caquetá in 1905-06, stated that the natives distinguished four "kinds" of yoco and also reported (*translated*):

> There is a *yoco blanco* ["white yoco"] and a *yoco colorado* ["red yoco"].

His specimens have long since been lost, and he does not explain the exact nature of the differences between the kinds of yoco.

During my ethnobotanical studies in the Putumayo, I repeatedly questioned natives concerning the differences between *yoco blanco* and *yoco colorado* with conflicting replies. While it is true that the sap expressed from some stems makes a light chocolate-brown mixture when added to cold water, that from other stems makes a whitish milky mixture. Both taste the same, and both are equally effective as a stimulant. The Indians do not prefer one to the other. I find that it is impossible to distinguish botanically the liana which gives *yoco blanco* from that which yields *yoco colorado*, but the natives can distinguish them immediately by slashing the bark with a machete. I have noted that *yoco colorado* nearly always is a much stouter and apparently older plant than *yoco blanco*. It is possible that there is a chemical difference due to age. It seems hardly probable that the differences are due to seasonal or soil conditions, for *yoco blanco* and *yoco colorado* grow side by side and can be collected at the same time.

Klug has collected data of great interest relative to the different "kinds" of yoco. His five collections from Umbría are annotated with different names which would suggest that the Inga Indians of the region regard them as different. Klug's notes unfortunately do not explain the nature of these differences nor why the Indians have these distinct names. A careful examination of Klug's specimens fails to reveal a single botanical character which would suggest that any other species or variety is represented; all of his collections are referable to *Paullinia Yoco*. The several common names annotated by Klug are as follows: *blanco yoco; huarmy yoco; taruca yoco; yagé yoco; canangucha yoco; verde yoco*. No mention is made of *yoco colorado*. Two of these names suggest that yoco may be used in connection with other plants. The name *yagé yoco* might mean that *Paullinia Yoco* is used together with the narcotic *yajé* (*Banisteriopsis inebrians* Morton and other species). *Canangucha yoco* might suggest that *Paullinia Yoco* is taken with *chicha de canangucha*, an alcoholic drink prepared from the fruits of *Mauritia minor* Burrett. All of my data, however, as well as those which others have published, indicate that yoco is always used alone.

III. The chemistry of yoco

A number of sections of stem (totalling some ninety-six pounds) of the type plant (*Schultes 4028*) were collected and have been submitted to Dr. Barriga-Villalba of the Laboratorios Samper-Martínez, Bogotá, for phytochemical examination. The results will be published in an early number of *Caldasia*. This analysis will be interesting because former chemical studies of yoco were undertaken with material the exact identity of which is as yet not known.

In 1926, Rouhier and Perrot ("Le 'yocco,' nouvelle

drogue simple à caféine" Bull. Sci. Pharm. 33 (1926) 537-539—Trav. Lab. Mat. Méd. 17, pt. 6[2] (1926)—Compt. Rend. 182 (1926) 1494—Chem. Zentralbl. 1 (1927) 138) reported on the chemical constitution of yoco stems received from Dr. Claes and from a French consular official in Quito, Ecuador. At the time of the publication of this report, the plant had not been identified even as to the family. For this reason, Rouhier and Perrot were forced to refer to the plant simply as "le yocco, nouvelle drogue simple à caféine." As I have indicated above, it is probable that these plant materials, which shortly after the appearance of Rouhier and Perrot's paper were mistakenly identified as *Paullinia scarlatina*, are referable to *Paullinia Yoco*.

According to Rouhier and Perrot, yoco "bark" (by which is meant probably all tissues outside of the xylem) contains 6.1% ash, 12.3% water, and 2.73% caffeine. Michiels and Denis (Journ. Pharm. Belg. 8 (1926) 795—Chem. Zentralbl. 1 (1927) 138) report that the inflorescences of yoco also contain caffeine.[3]

Thus, yoco may be added to that list of plant species which are rich in caffeine. Among the more important caffeine-yielding plants are: coffee (*Coffea arabica* L. and other species) of the *Rubiaceae*; tea (*Camellia sinensis* (L.) O. Ktze.) of the *Theaceae*; kola nut (*Cola nitida* (Vent.) A. Chev.) and cacao (*Theobroma Cacao* L.) of the *Sterculiaceae*; maté (*Ilex paraguariensis* St. Hil.) of the *Aquifoliaceae*; and guaraná (*Paullinia Cupana* HBK.) of the *Sapindaceae*.

In all of these species, the highest caffeine concentration is found in the leaves, fruits or seeds. Consequently, these are the economically important parts of the plant.

[3] The chemical composition of yoco has been summarized in Wehmer: "Die Pflanzenstoffe," ed. 2, 2 (1931) 730.

Paullinia Yoco is apparently the first plant in which the bark is utilized for its caffeine content.

IV. Notes on related species of Paullinia

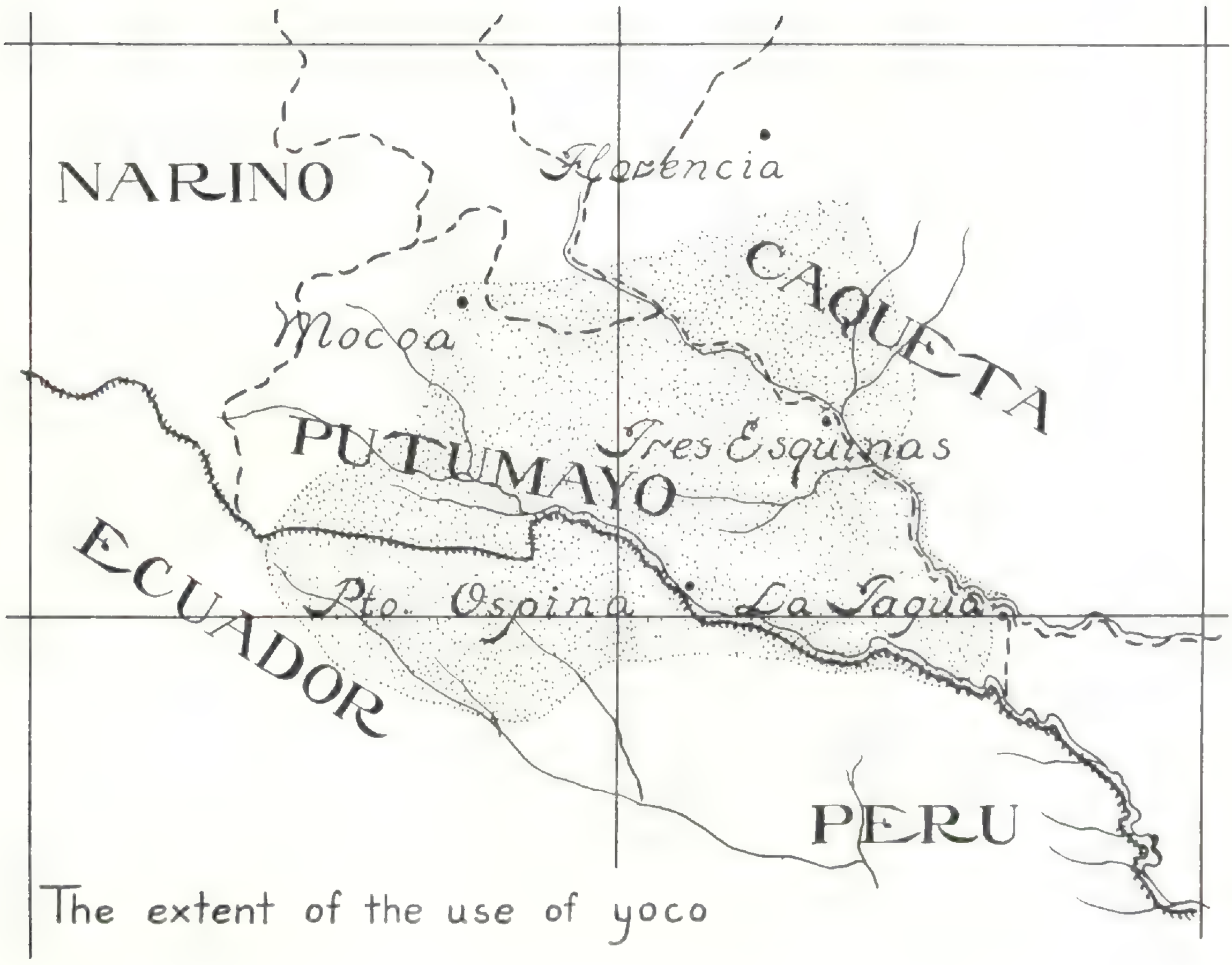
It is of interest to note that *Paullinia* and the very closely related genus *Serjania* contain extremely toxic species, including a number of very active fish-poisons.

Paullinia Curarа L. is an ingredient of a certain type of curare in South America. *Paullinia australis* St. Hil. is a highly toxic Argentinian species containing in its leaves and roots a sedative and narcotic alkaloid. The bark of the roots of *Paullinia pinnata* L. (*timbo*) is a narcotic poison, and in Brazil certain Indians are said to employ it in the preparation of a slow poison.

Guaraná, derived from *Paullinia Cupana* HBK., said to be the most stimulating of all the caffeine beverages, is used in most of the Amazon Valley of Brazil as a coffee substitute. The seeds are pulverized, mixed with cassava flour (*Manihot esculenta* Crantz), and formed into small moulds of various shapes. Upon drying, these moulds become very hard. The beverage, which is made by dissolving this *pasta guaraná* ("guaraná paste") in hot or cold water, is astringent and bitter due to the rather high tannin content (2–3%) of this species. The stimulant properties are due to the high caffeine content which is usually 3–4%, but which may occasionally be as high as 6%. *Paullinia sorbilis* Mart., usually considered to be the same as *P. Cupana*, but which is possibly distinct, is also a source of guaraná.

V. The use of yoco

The area in which yoco is employed as a stimulant is rather restricted, comprising, according to all available reports, the Comisaría del Putumayo and the westernmost part of the Comisaría del Caquetá in Colombia, a



The extent of the use of yoco

EXPLANATION OF THE ILLUSTRATIONS

PLATE XXVIII. PAULLINIA YOCO *Schultes & Killip.* Upper figure, basal portion of a stem of the liana showing the milky sap exuding from the wound. Puerto Porvenir, on the Río Putumayo near the mouth of the Río San Miguel, Comisaría del Putumayo, Colombia, July 1942. (Photograph of the type: *Schultes 4028.*)—Lower figure, pieces of the stem. Santa Rosa, on the upper Río San Miguel, Comisaría del Putumayo, Colombia, April 1942.

PLATE XXIX. PAULLINIA YOCO *Schultes & Killip.* Upper figure, a Kofán Indian preparing yoco: rasping the epidermis, cortex and phloem. Puerto Porvenir, on the Río Putumayo near the mouth of the Río San Miguel, Comisaría del Putumayo, Colombia, July 1942.—Lower figure, a Kofán Indian preparing yoco: expressing the milky sap of the rasped material. Puerto Conejo, on the upper Río San Miguel, Comisaría del Putumayo, Colombia, April 1942.

Plate XXVIII

Plate XXIX

small portion of Peru which borders upon the Colombian Putumayo, and northeastern Ecuador as far south as Agaurico and possibly beyond.

It is strange that the use of yoco is so restricted since *Paullinia Yoco* or very closely allied species apparently have a wider range. The Huitoto and Bora Indians of the Colombian Intendencia del Amazonas do not use yoco, do not know the plant by this name, and are not aware of the purpose for which Indians of the neighboring parts of the Putumayo employ it. Even those Huitotos who have migrated from the Amazonas to the Coreguaje Indian area of the Caquetá and who have adopted many Coreguaje customs, have not taken up the use of yoco. The fact that the Huitoto Indians use coca habitually might seem to explain their lack of interest in yoco. This is not the case, however, for in the town of Nuevo Mundo (near Tres Esquinas), Caquetá, I found the Coreguaje Indians employing both coca and yoco.

So far as I have been able to ascertain, the only tribes which drink yoco are the Ingas of Mocoa, Umbría, Puerto Limón and other localities in the Putumayo; the Sionas of the Putumayo; the Kofáns of San Antonio Guamues, Puerto Conejo, Santa Rosa, and Puerto Ospina in the Putumayo and of Aguarico in Ecuador, and the Coreguajes of the Caquetá. (cf. also Claes: "Chez les Indiens Huitotos et Correguajes" Bull. Soc. Roy. Belg. Geogr., fasc. 2 (1931) 101—Gaspar de Pinell, loc. cit., 161.) All of these Indians use the name *yoco* which is apparently of Inga origin. In the language of the Kofán, Siona and Coreguaje Indians there is no name for *Paullinia Yoco.*

Although it is a stimulant and not a food, *Paullinia Yoco* is one of the most important plants in the diet of the Indians of the Putumayo and western Caquetá. Every Indian household keeps a large supply of yoco stems,

and few Indians ever make a long trip through the forest or by canoe without carrying two or three pieces. Yoco is cut from wild lianas chiefly. I have never seen *Paullinia Yoco* cultivated, but Padre Javier de Quito, a missionary who has spent nearly forty years in the Putumayo, informs me that occasionally a plant may be found under cultivation in an Indian clearing. In 1906, Bayon reported that the Indians of the Caquetá "cultivate it with care."

Because of the great demand for yoco, wild plants of *Paullinia Yoco* are becoming hard to find wherever there are Indian settlements. It is believed that scarcity of yoco is one of the causes of the occasional abandonment of excellent town-sites by an entire village of Indians, although epidemics account for most of these town-migrations. The Kofáns of Puerto Ospina informed me that there is not a sufficient supply of yoco nearer than twenty kilometers and that the only remedy will be to move the village nearer to the wild supply. At the present time, an Indian from the vicinity of Puerto Ospina must make a long day's trip in order to reach a region where plants of yoco are growing and, after arriving, must search to find a liana suitable for felling.

Lianas of *Paullinia Yoco* which have a stout stem at least three inches in diameter at the base are utilized (plate xxviii, upper figure). Usually several trees must be felled before the liana falls to the ground. Starting at the root, the stem is then cut into pieces which may vary from one to three feet in length. These pieces are stored in cool corners of Indian houses (plate xxviii, lower figure) and retain their stimulating properties for a month or even longer.

In the preparation of the beverage from the yoco stems, the epidermis, cortex and phloem (all of the softer tissues external to the xylem) are rasped (plate xxix, upper fig-

ure). The scraps of material thus obtained are squeezed to express the caffeine-bearing sap into cold water. If the yoco is rather old and dry, the rasped material is allowed to soak (plate xxix, lower figure) and the stimulating principles are quickly removed. After extraction, the remains of the rasped tissues are discarded. When prepared, *yoco blanco* is a cloudy milky-white liquid, but in the case of *yoco colorado* the liquid is light chocolate-brown in color. Both kinds are used without discrimination; apparently one is as strong a stimulant as the other. Yoco is never made with hot water. In this respect it differs markedly from *Paullinia Cupana* and other caffeine-yielding plants, for the extraction of caffeine from these plants is usually accomplished with warm or hot water.

Each dosage of yoco consists of the expressed sap of approximately 90–100 grams of rasped material served in a "jícara," a bowl made from the fruit of *Crescentia Cujete* L.

It is the general custom of the Indians of the Putumayo to eat nothing until noontime. Instead, yoco is taken each morning between five and six o'clock. One or two "jícaras," each half full of the beverage, are sufficient to allay all sensations of hunger for at least three hours and to supply muscular stimulation. I have tried yoco on many occasions and find that the statements of the natives regarding the stimulating and hunger-allaying properties are not in the least exaggerated. The effects of the stimulant are rapid in action. A tingling of the fingers and a general feeling of well-being are noticeable ten minutes after drinking the contents of two "jícaras." I have made long trips through the forests, and, taking nothing but yoco, have felt neither fatigue nor hunger. Klug (unpublished notes: "Plants of Umbría, between the Rivers Alto Putumayo and Alto Caquetá, 360 meters above sea level," preserved in the United

States National Herbarium and in the Library of Economic Botany, Botanical Museum of Harvard University) has written:

"I, myself, as well as three students who accompanied me on my exploration to the upper Río Putumayo, have taken yoco on different occasions, and we were able to state that this happened in every detail: in a whole day of walking (20–25 kilometers) not only have we felt no hunger, but we have felt no fatigue . . . . In the regions mentioned one never finds an Indian making a long trip by land or by canoe without taking along a branch of this vine, which is his food and keeps him from feeling the fatigues of his journey."

In 1906, Zerda Bayon (loc. cit.) wrote (*translated*):

They take it to acquire strength, vigor and agility for their long canoe-paddlings, for hunting trips, and for their tiring trips through the jungles; and in order not to feel hunger. Their breakfast is infallibly a draught of yoco . . . .

In addition to its use as a stimulant, yoco is employed, in larger dosages, as an anti-malarial febrifuge and as a medicine in the treatment of a bilious disease which is frequent in the Putumayo. I found these uses prevalent among the Inga, Siona, Kofán and Coreguaje Indians. The same uses have been reported by several investigators who have been in other parts of the Putumayo and Caquetá. Klug (loc. cit.), for example, reports:

. . . . this liana has the property, perhaps chiefly antibilious, of curing the malarial fevers in this region . . . .

It is with pleasure that I express herewith my appreciation of the assistance given me during my ethnobotanical investigations in the Putumayo by the Colombian Ministerio de Guerra and the Capuchin Mission of the Putumayo and Caquetá. Special thanks are tendered to Colonel Gomez-Pereyra, commander of the base at Caucayá; to Captain Rojas-Scarpeta, commander of the gunboat "Cartagena," and to the Reverend Padres Gaspar de Pinell and Marcelino de Castellví.

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